US009249982B2

(12) **United States Patent**
Brown et al.

(10) **Patent No.: US 9,249,982 B2**
(45) **Date of Patent: Feb. 2, 2016**

(54) **CEILING VENT DIFFUSER**

(75) Inventors: **Chad A. Brown**, Toronto (CA); **Robert G. Dickie**, King City (CA); **Petri J. Nurmela**, Thunder Bay (CA); **Jonathan D. Liberty**, Newmarket (CA)

(73) Assignee: **Airvisor Inc.**, Toronto, Ontario (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1239 days.

(21) Appl. No.: **13/181,237**

(22) Filed: **Jul. 12, 2011**

(65) **Prior Publication Data**

US 2011/0269391 A1 Nov. 3, 2011

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/062,239, filed on Apr. 3, 2008, now Pat. No. 8,002,013.

(51) **Int. Cl.**

F24F 13/06	(2006.01)
F24F 13/08	(2006.01)
F24F 13/075	(2006.01)
F24F 13/14	(2006.01)

(52) **U.S. Cl.**

CPC ***F24F 13/075*** (2013.01); ***F24F 13/14*** (2013.01)

(58) **Field of Classification Search**

CPC F24F 13/14; F24F 13/075
USPC 454/358, 307
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

574,024	A *	12/1896	Eby	454/307
1,438,016	A *	12/1922	Bourke	74/503
1,450,819	A	4/1923	Sammes	
1,518,023	A *	12/1924	Ullom	160/56
1,558,518	A *	10/1925	Truax	49/53
1,668,712	A *	5/1928	Everhard	160/57
1,679,773	A *	8/1928	Knowles	454/289
1,939,294	A	12/1933	Hartwell	
1,975,686	A	10/1934	Froelich	
2,127,072	A	8/1938	Tinnerman	
2,177,994	A *	10/1939	Person	454/149
2,216,873	A *	10/1940	Browne	454/183
2,471,980	A *	5/1949	Collins et al.	454/333
2,558,421	A *	6/1951	Daninhirsch	454/302
2,580,663	A *	1/1952	Delf et al.	454/210
RE23,560	E	9/1952	Herbster	
2,630,055	A *	3/1953	Priesmeyer	454/311

(Continued)

FOREIGN PATENT DOCUMENTS

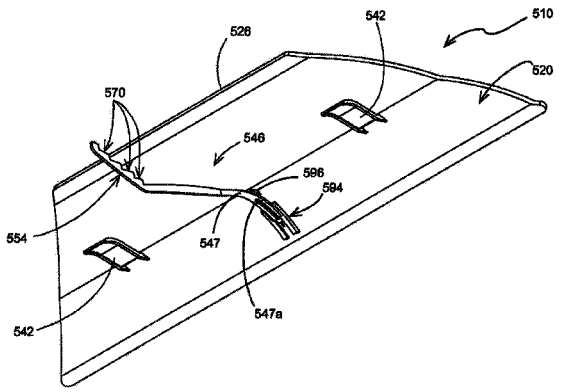
GB	1085389	9/1967		
JP	2003265873 A *	9/2003		B26B 1/08

Primary Examiner — Alissa Tompkins
Assistant Examiner — Phillip E Decker
(74) *Attorney, Agent, or Firm* — Sand & Sebolt

(57) **ABSTRACT**

A device for altering the airflow pattern from a ceiling vent diffuser by obstructing openings in a region of the diffuser. The device comprises a flexible member that is secured to a diffuser vane by a hook member and two tabs. The hook member has two or more engagement regions which enable it to engage vanes on different manufacturer's diffusers. The first end of the hook member is either pivotally secured to the flexible member or is engaged in an adjustment mechanism thereon. The adjustment mechanism allows the second end of the hook to be situated in different positions relative to an interior edge of the flexible member so as to accommodate different diffusers. An extension detachably engages the flexible member to increase the size thereof to accommodate larger diffusers.

21 Claims, 20 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2,761,371	A		9/1956	Parrish
2,784,659	A		3/1957	De Roo et al.
2,983,048	A	*	5/1961	Keller 33/27.03
3,003,244	A	*	10/1961	Fogliano 33/341
3,046,866	A		7/1962	Straub
3,768,235	A		10/1973	Meyer et al.
4,010,518	A		3/1977	Rejeski et al.
4,089,112	A	*	5/1978	Richards 30/162
4,602,556	A		7/1986	Gladden
4,693,174	A	*	9/1987	Anderson 454/292
4,760,773	A	*	8/1988	Pezzulli 454/358
4,815,934	A		3/1989	Rademaker
5,213,543	A		5/1993	Clarino
5,232,403	A	*	8/1993	Marotta 454/289
5,297,326	A		3/1994	Kline
D355,354	S	*	2/1995	Sterling D8/382
5,410,782	A		5/1995	Holyoake
5,564,975	A	*	10/1996	Northcutt 454/298
6,010,402	A		1/2000	Schmidt
6,261,174	B1	*	7/2001	Kuehn 454/290
6,554,880	B1	*	4/2003	Northcutt 454/292
6,840,852	B2		1/2005	Gehring et al.
7,074,124	B2	*	7/2006	Williams 454/358
7,635,298	B2		12/2009	Henneberry
2006/0040607	A1		2/2006	Perez et al.
2007/0181271	A1		8/2007	Earnest
2011/0081853	A1	*	4/2011	Roebuck 454/307
2013/0128450	A1	*	5/2013	Redshaw et al. 454/308

* cited by examiner

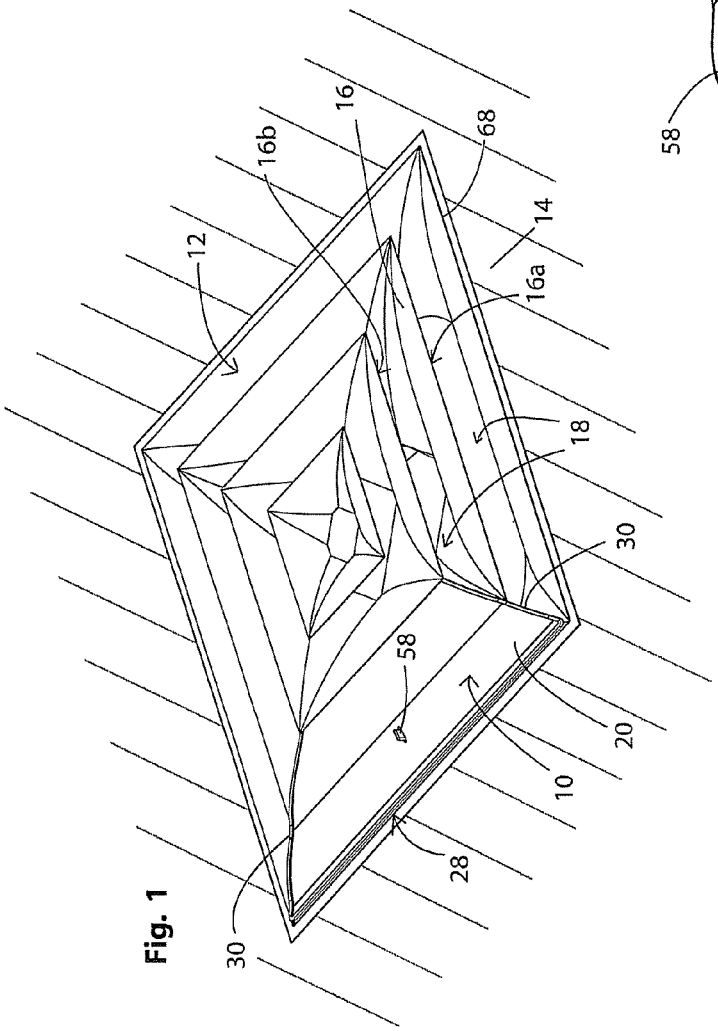

16
16b
68
12
14
16a
18
30
58
10
20
28
30

Fig. 1

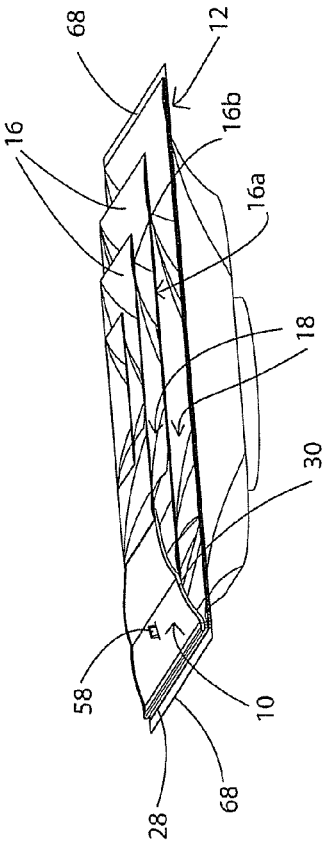

68
12
16
16b
16a
18
30
58
10
28
68

Fig. 2

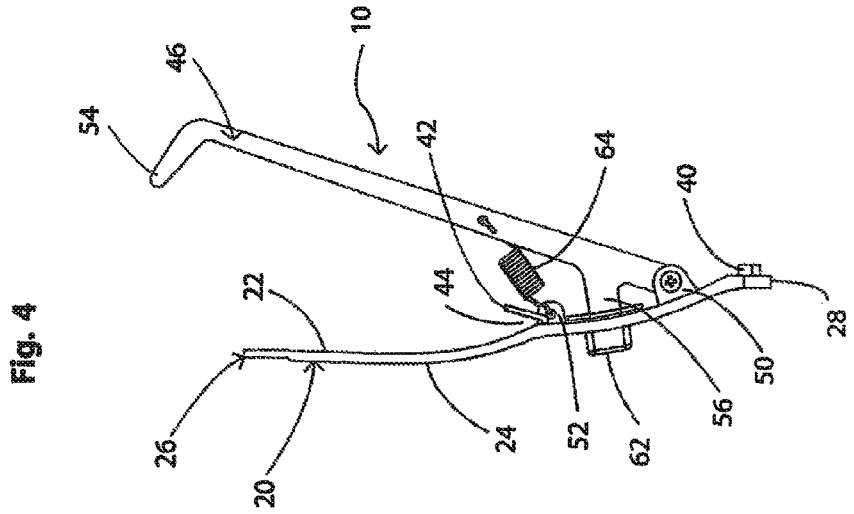


Fig. 4

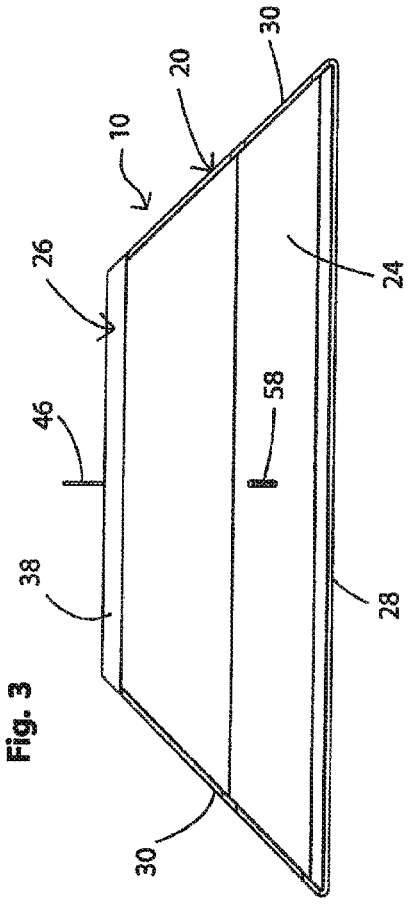


Fig. 3

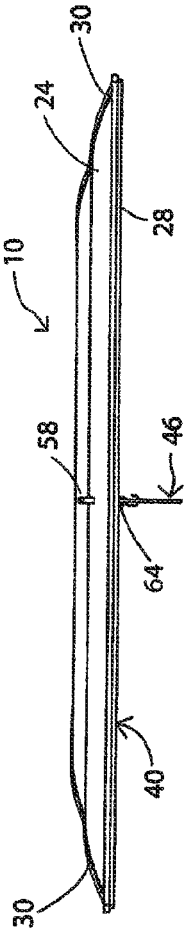


Fig. 5

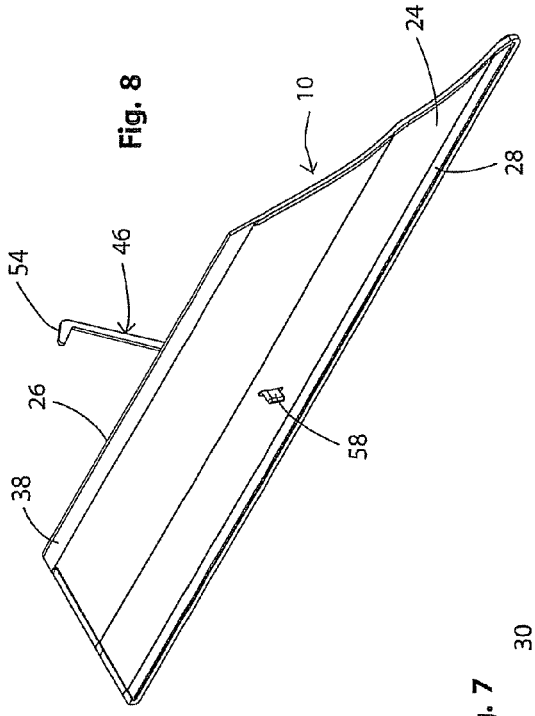


Fig. 8

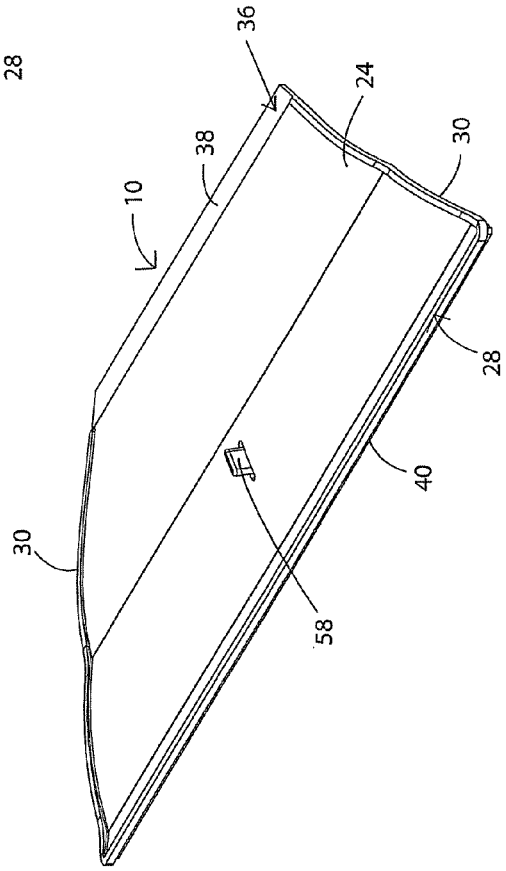


Fig. 7

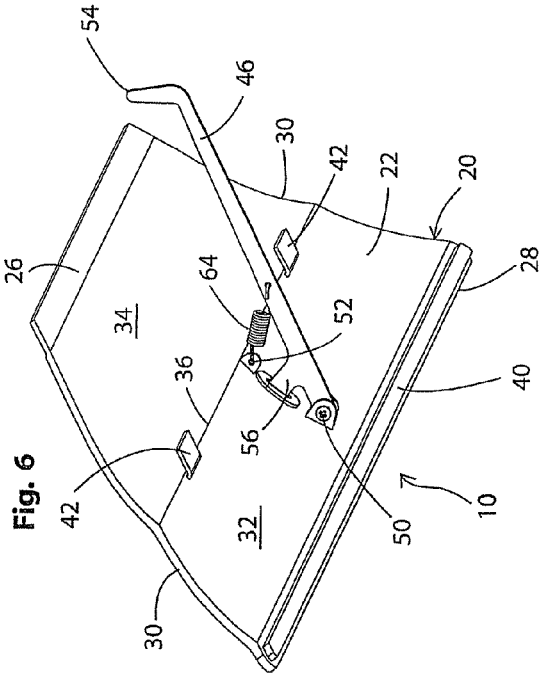


Fig. 6

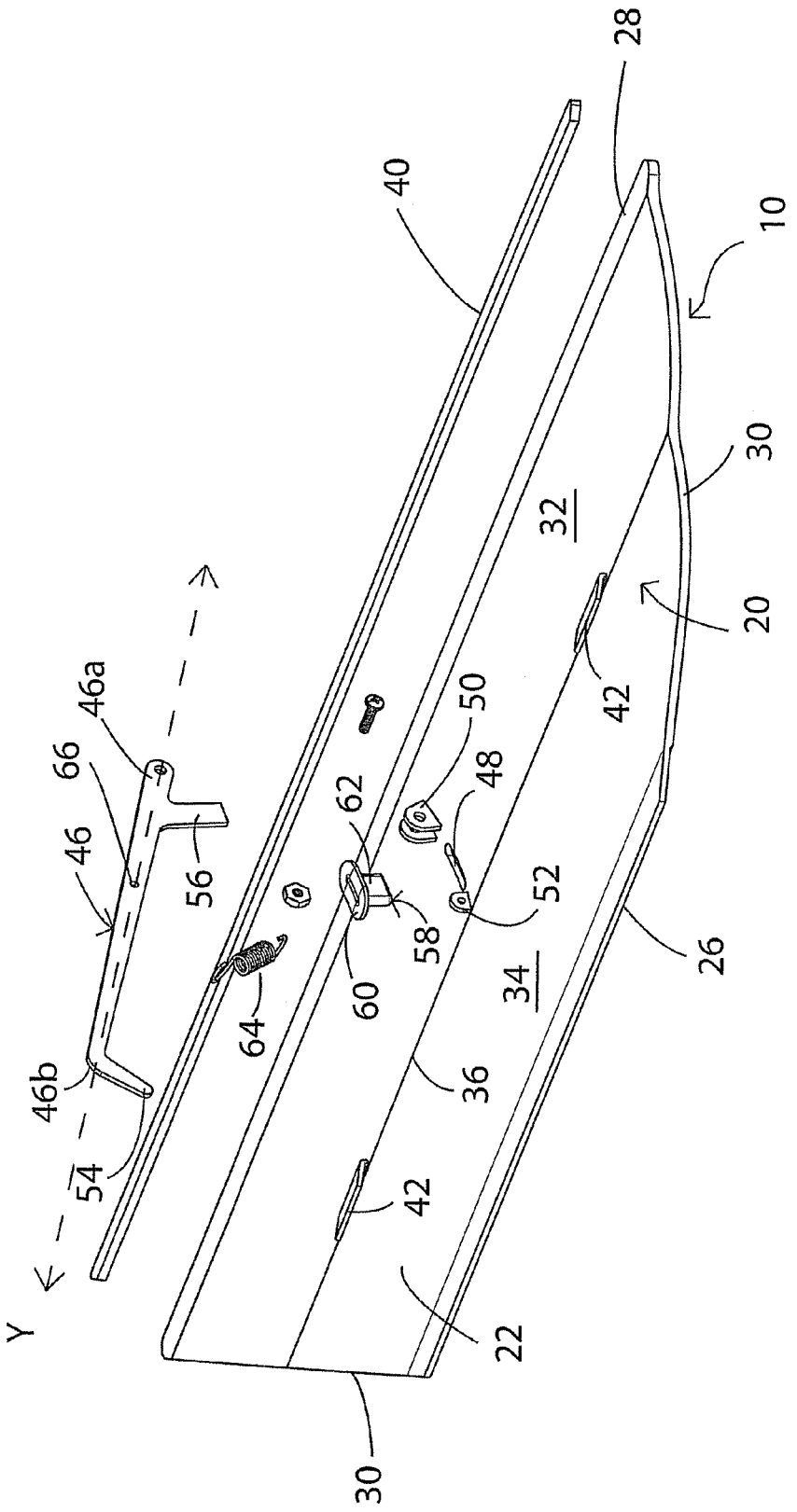

28
40
10
30
32
20
42
50
48
62
46a
66
46
56
52
58
60
64
34
26
36
46b
54
42
22
30
Y

Fig. 9

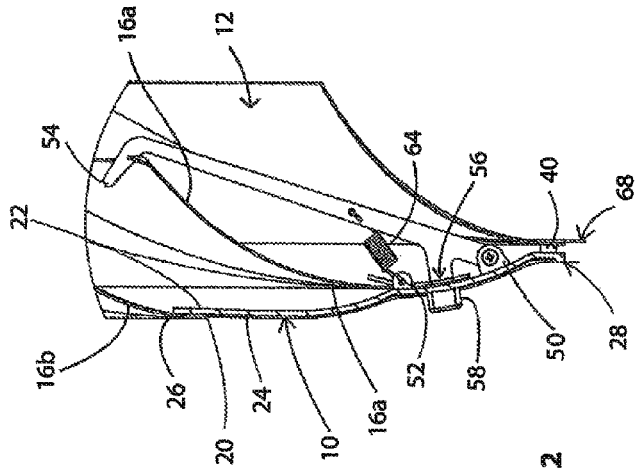


Fig. 12

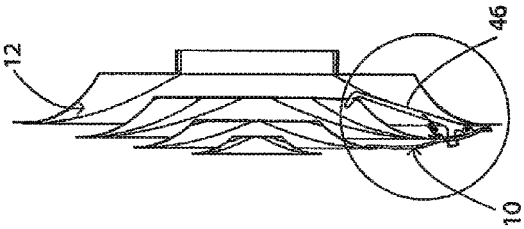


Fig. 11

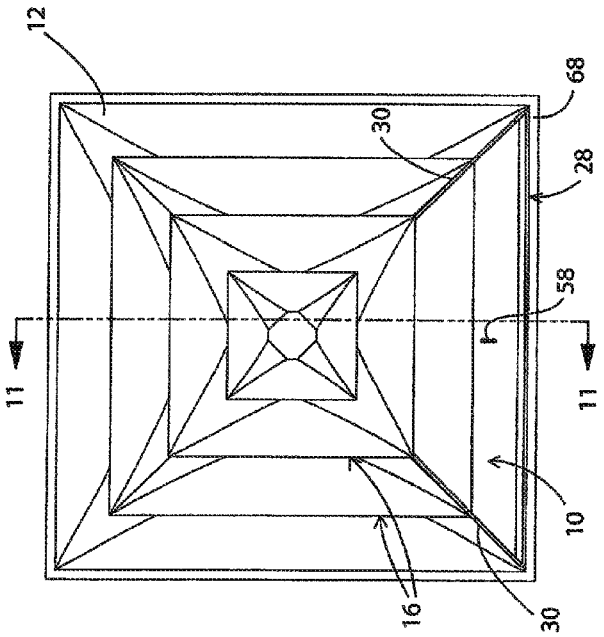


Fig. 10

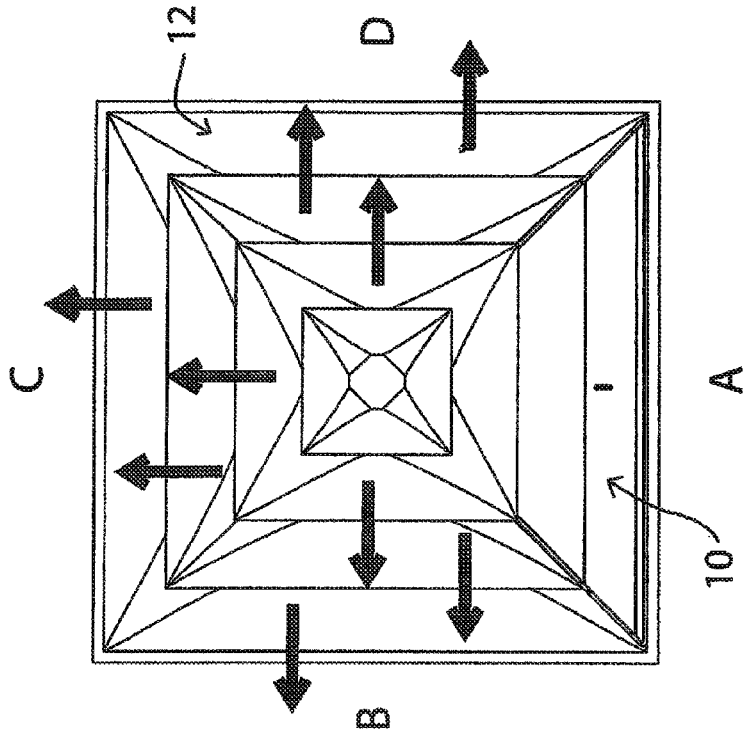


Fig. 14

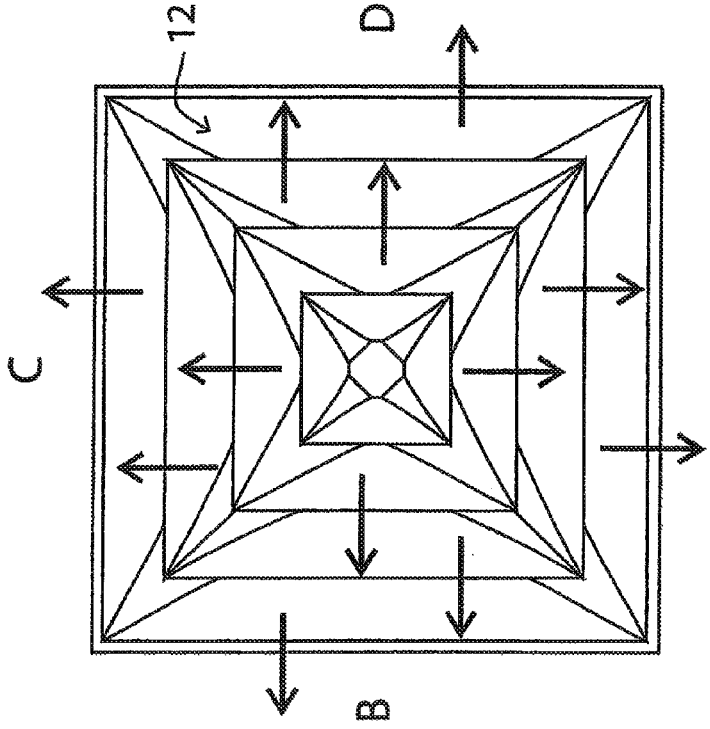


Fig. 13 PRIOR ART

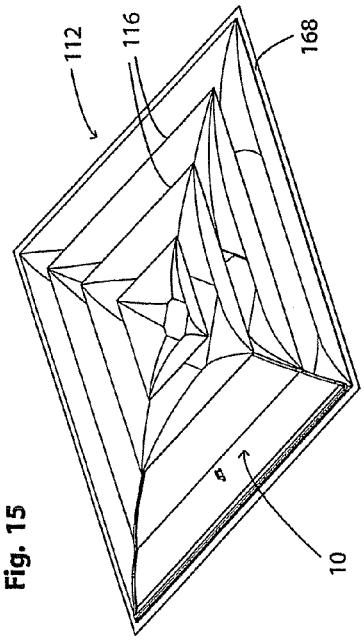


Fig. 15

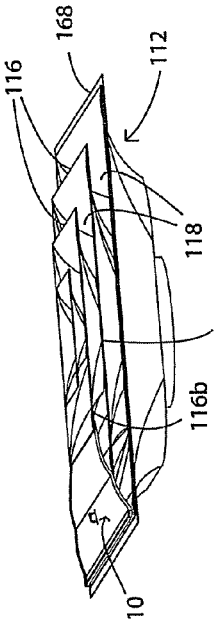


Fig. 16

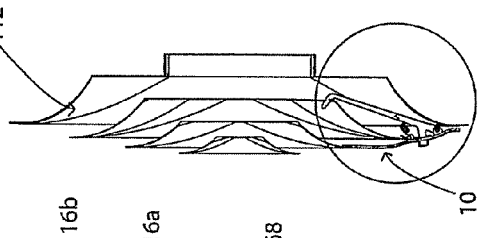


Fig. 18

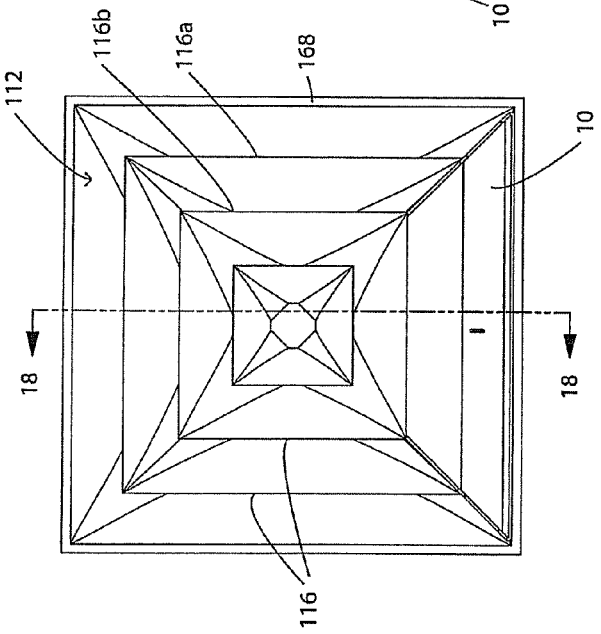


Fig. 17

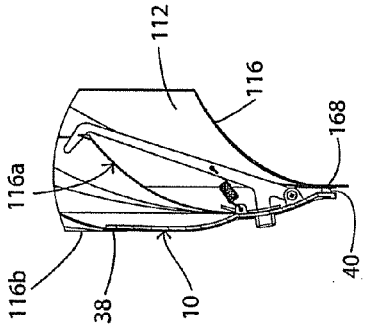


Fig. 19

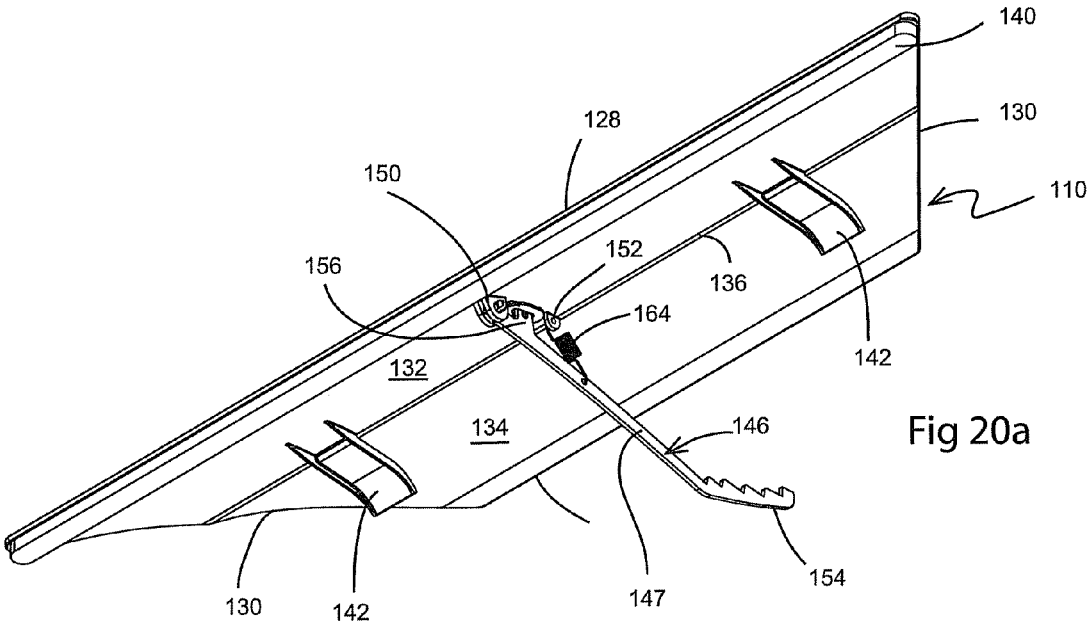


Fig 20a

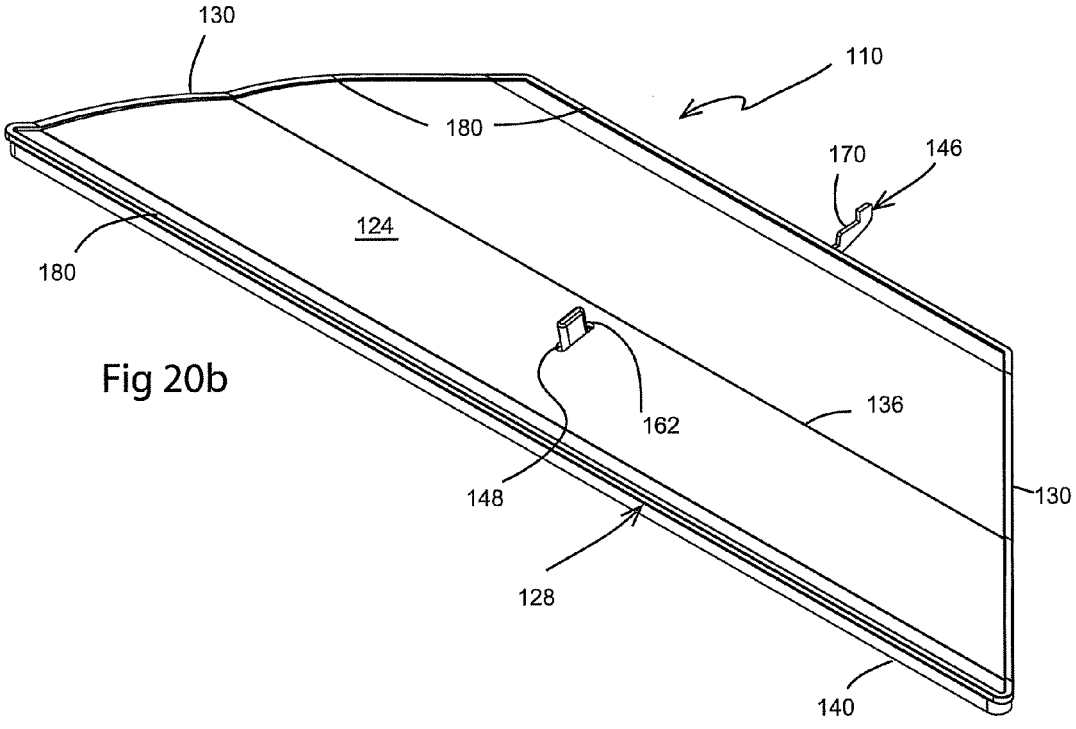


Fig 20b

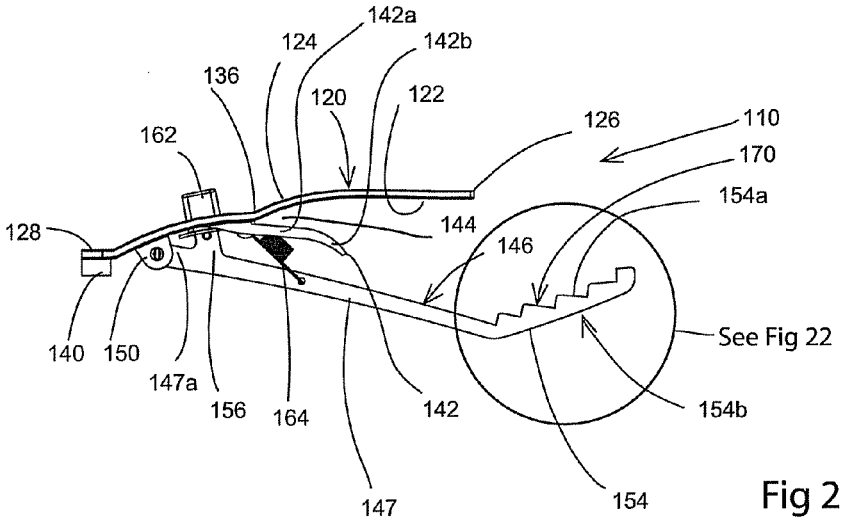

142a
124
142b
136
120
122
126
110
162
170
154a
128
144
146
See Fig 22
140
150
147a
156
164
142
154b
147
154

Fig 21

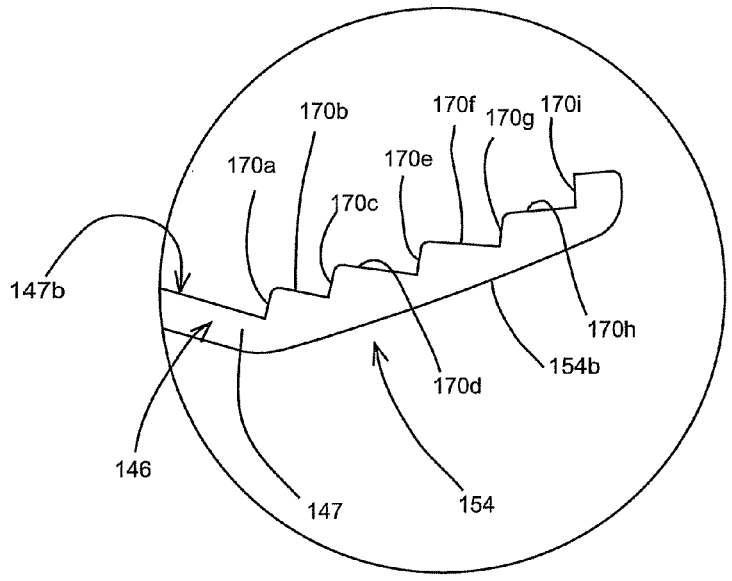

170b
170f
170g
170i
170a
170e
170c
147b
170h
154b
170d
146
147
154

Fig 22

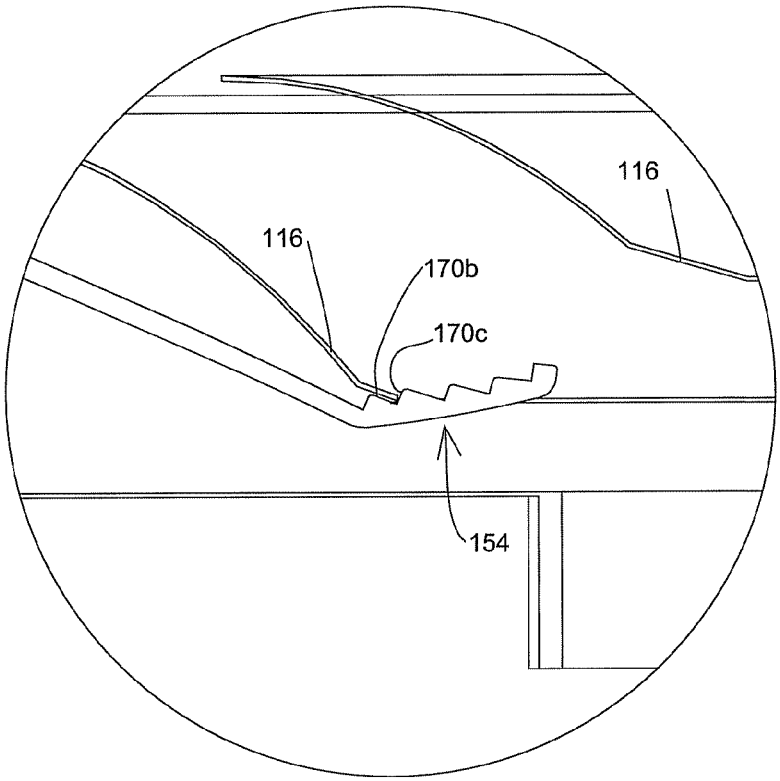


Fig 23a

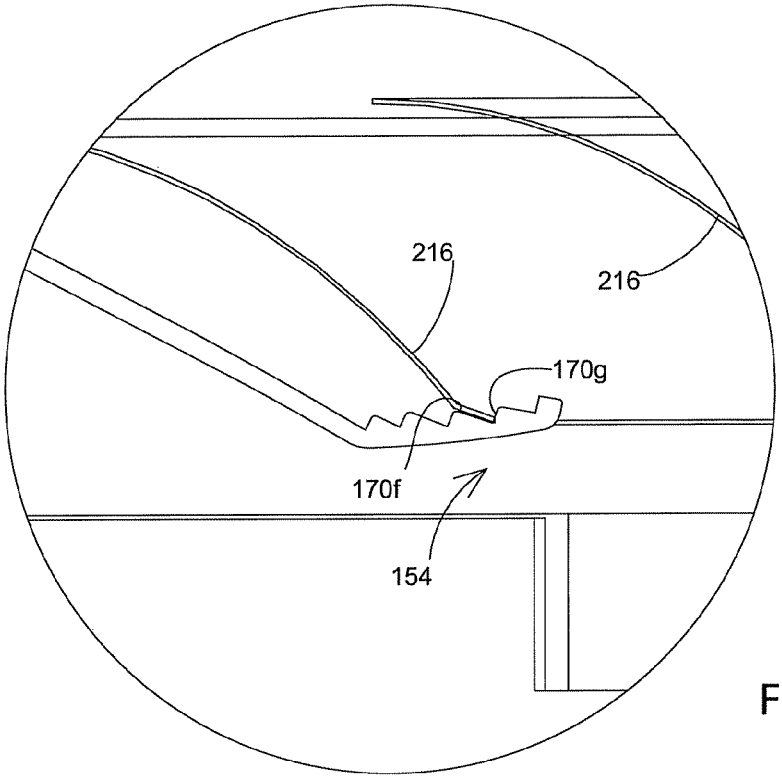


Fig 23b

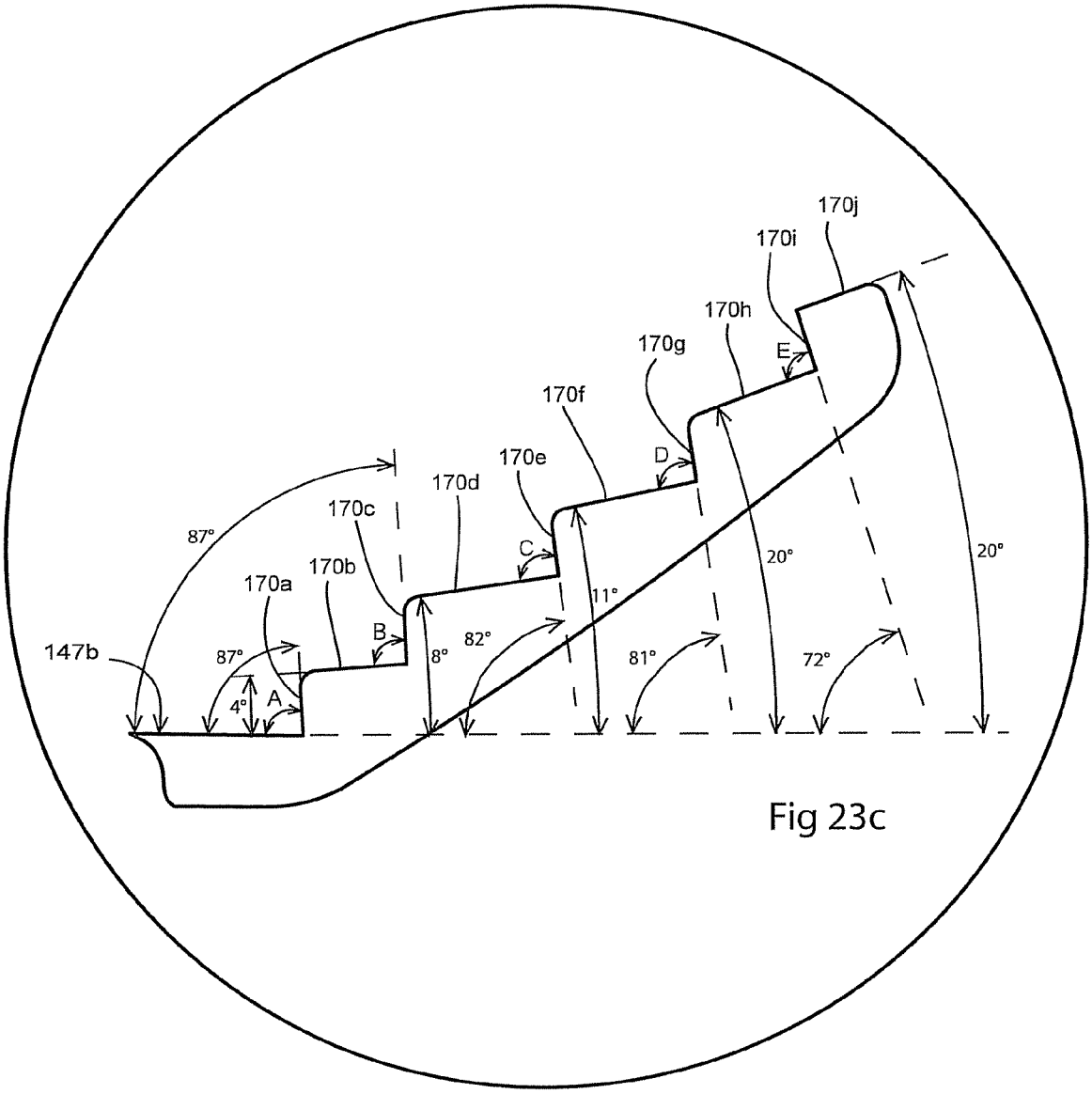

170j
170i
170h
170g
E
170f
D
170e
170d
170c
C
87°
170b
170a
B
147b
87°
8°
82°
11°
20°
20°
4°
A
81°
72°

Fig 23c

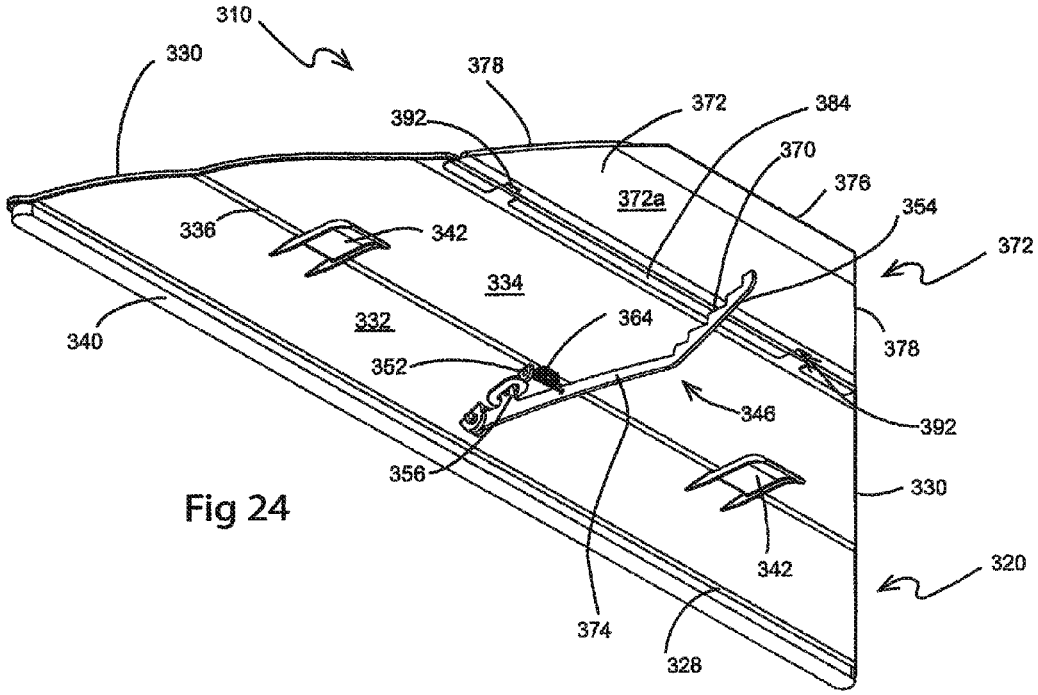

310
330
378
392
372
384
370
376
372a
354
372
336
342
334
332
340
364
352
378
346
392
356
330
342
320
374
328

Fig 24

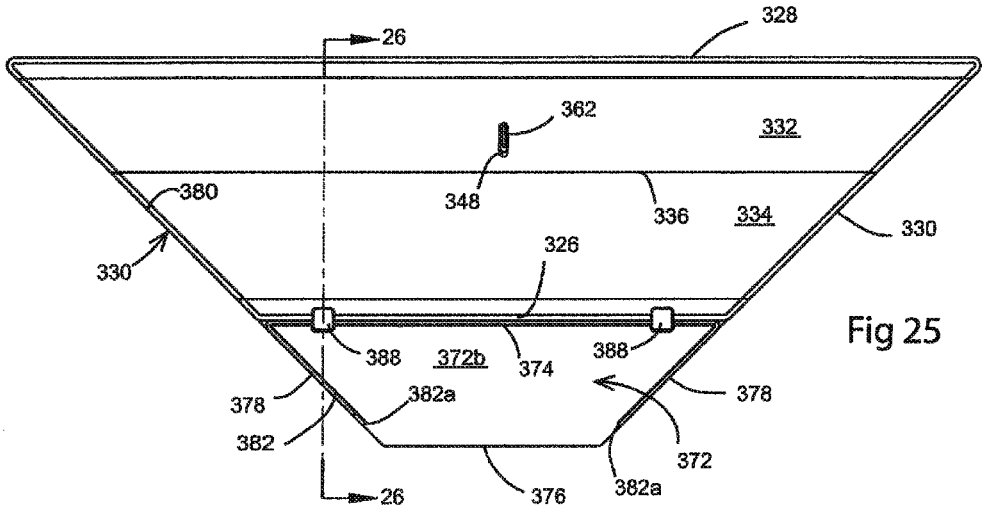


Fig 25

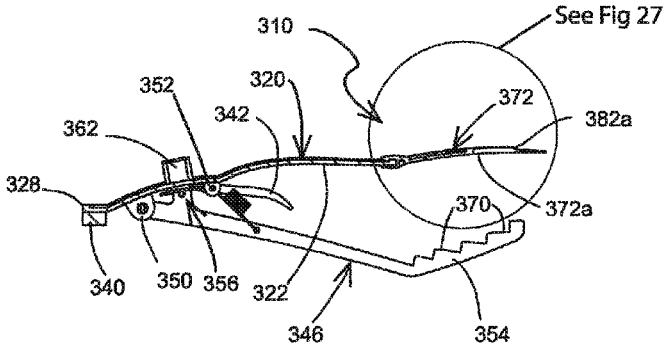


Fig 26

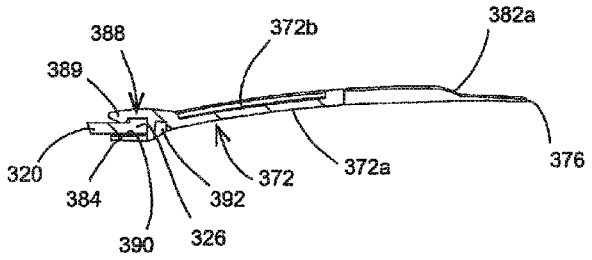


Fig 27

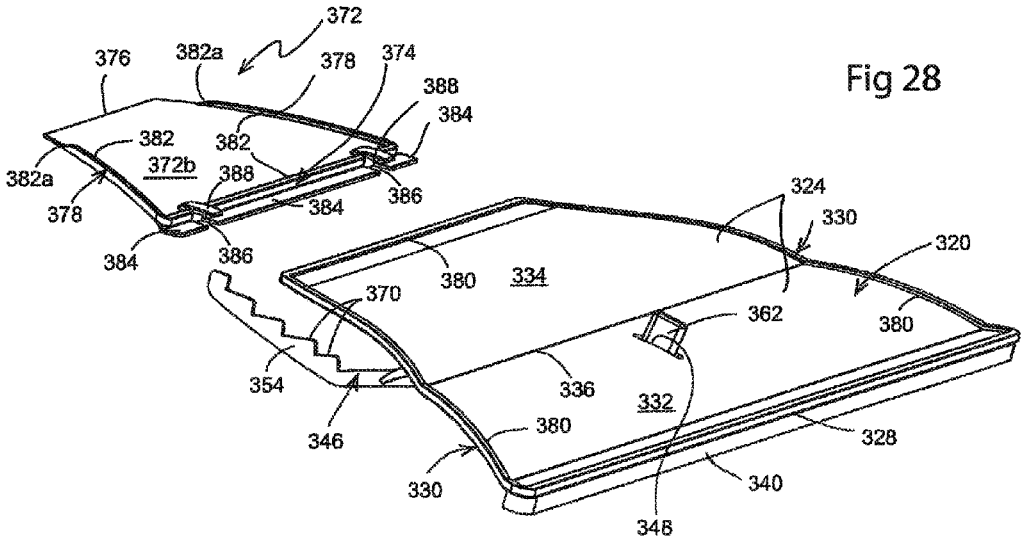

372
376
382a
378
374
388
384
382
382
372b
388
382a
378
384
386
384
386
380
334
324
330
320
370
362
380
354
336
332
346
380
328
330
340
348

Fig 28

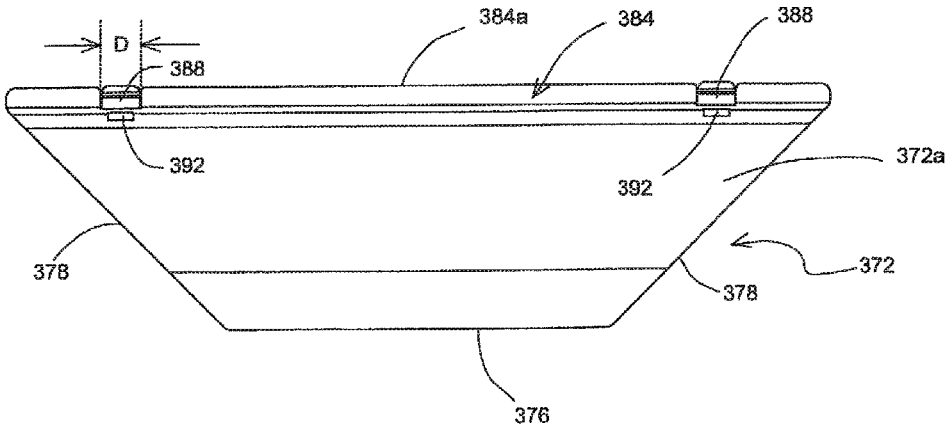

D
384a
384
388
388
392
392
372a
378
372
378
376

Fig 29

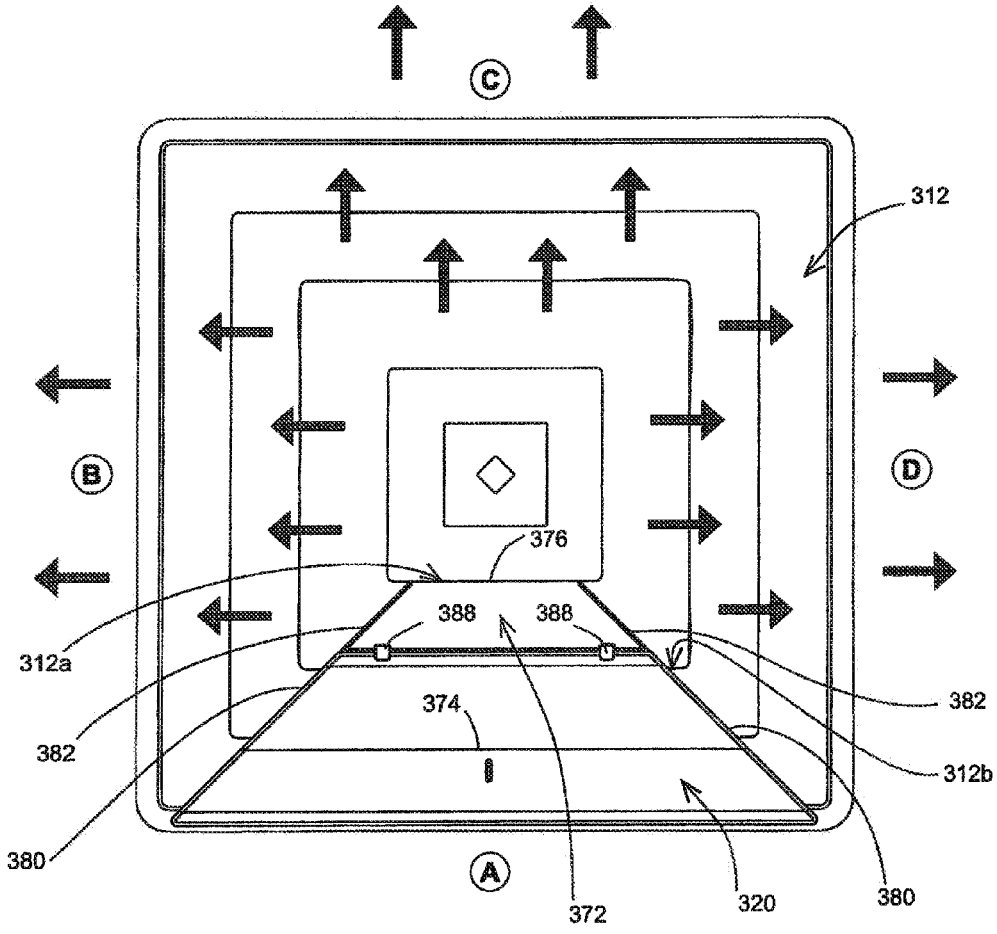


Fig 30

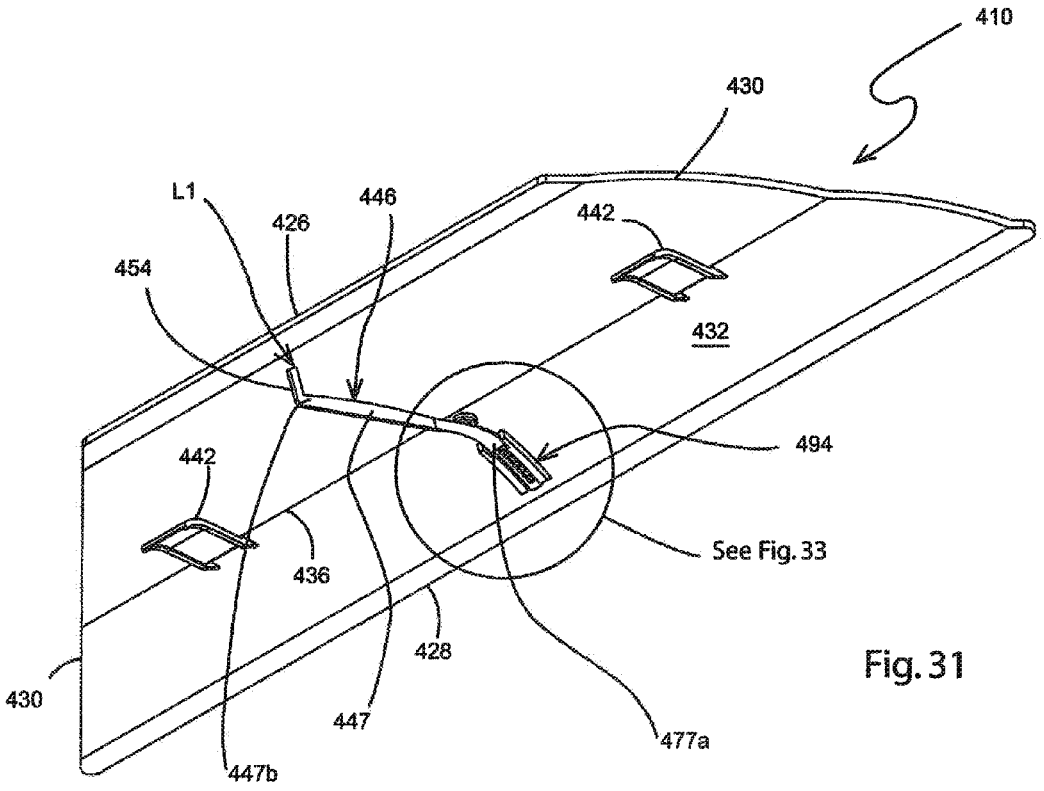

410
430
L1
426
446
442
454
432
494
442
436
See Fig. 33
428
430
447
477a
447b

Fig. 31

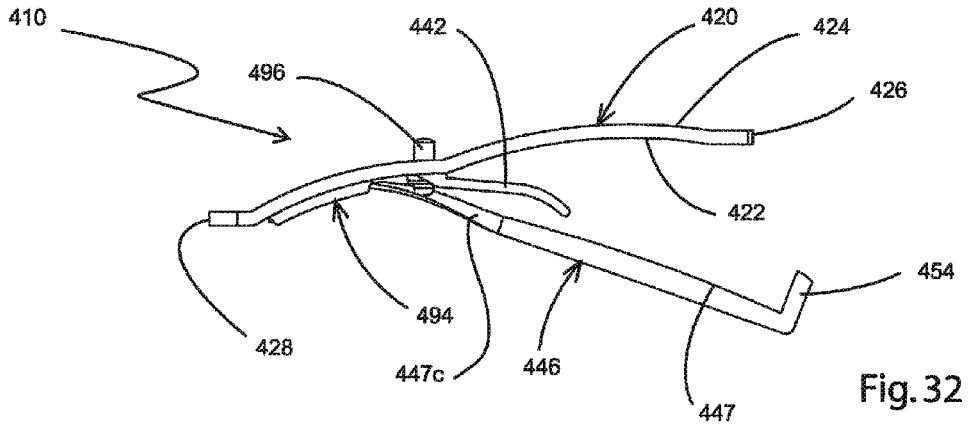

410
442
420
424
496
426
422
454
494
428
447c
446
447

Fig. 32

Fig 33a

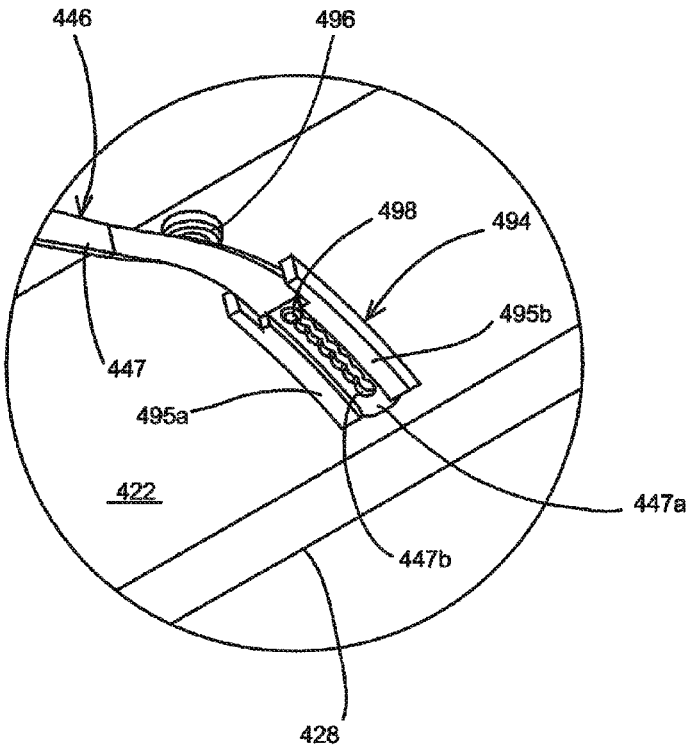
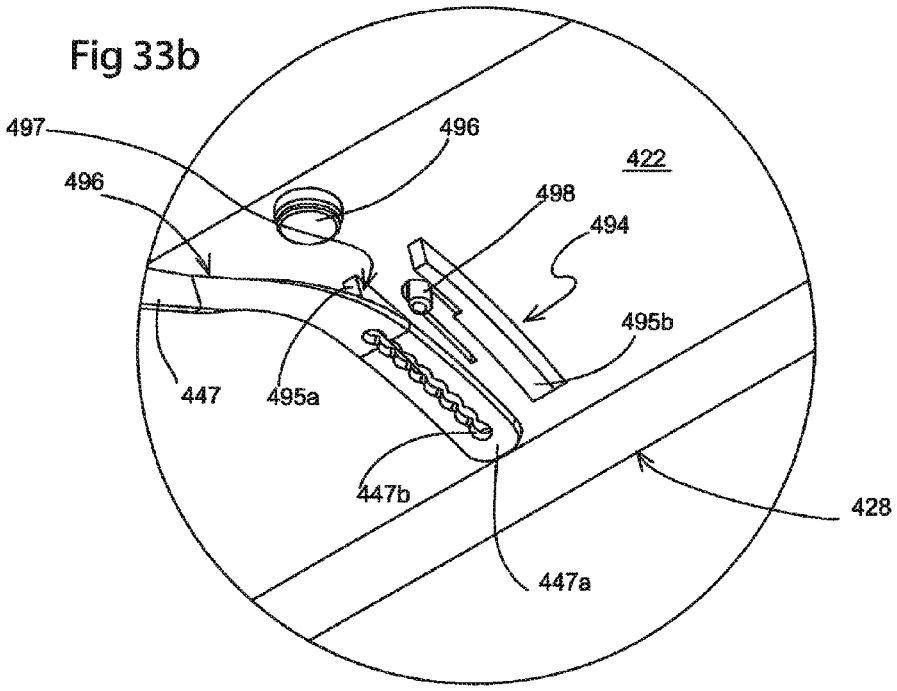


Fig 33b



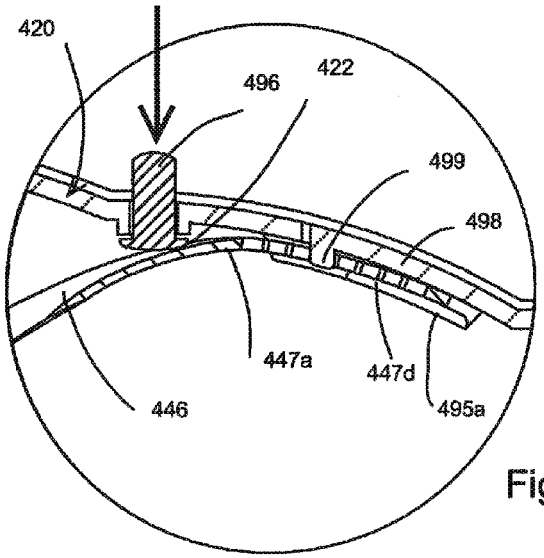

420
496
422
499
498
447a
447d
446
495a

Fig 34

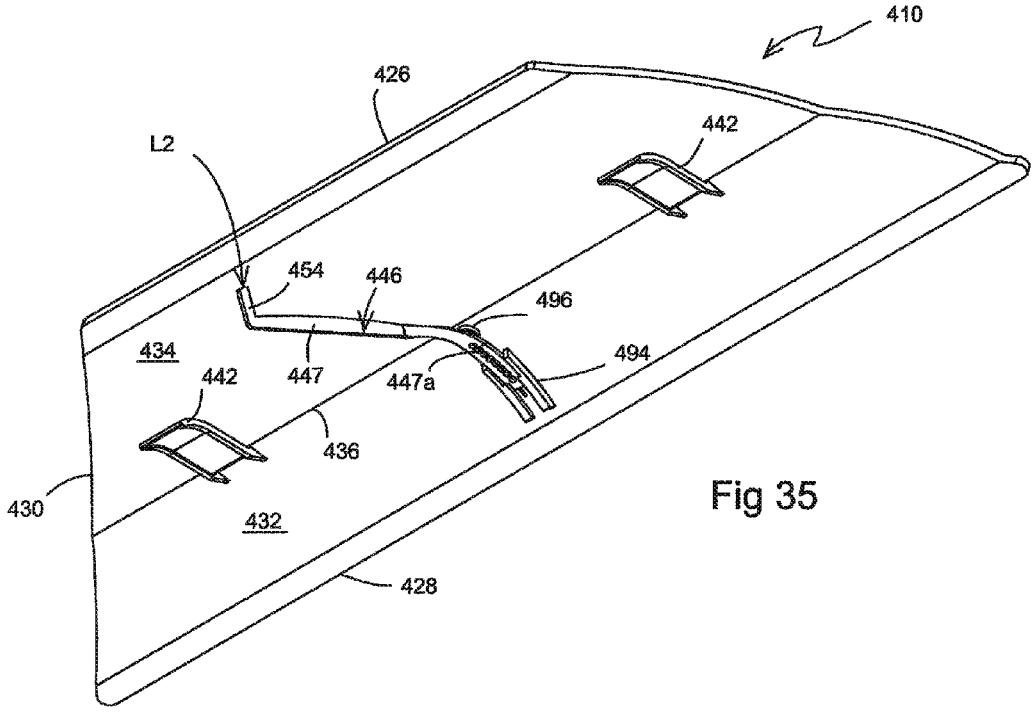

410
426
L2
442
454
446
496
434
442
447
447a
494
436
430
432
428

Fig 35

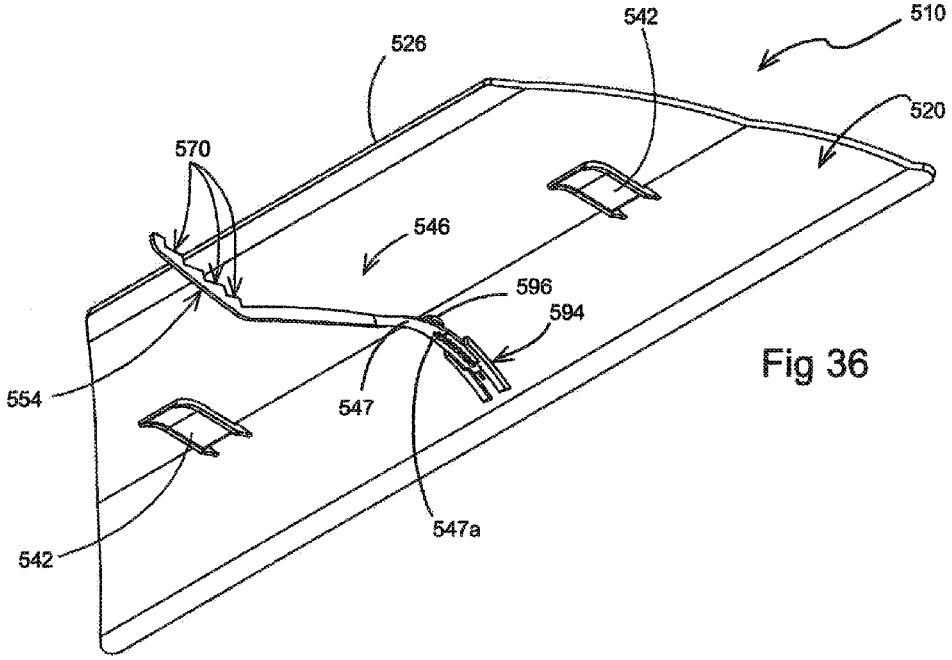

542
510
526
520
570
546
596
594
554
547
547a
542

Fig 36

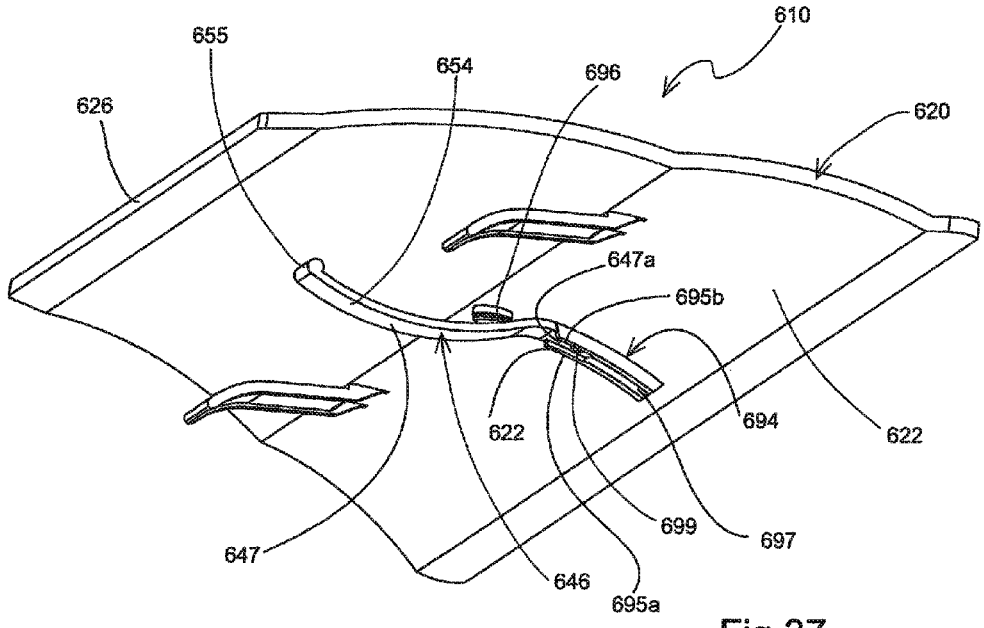

610
655
654
696
626
620
647a
695b
622
694
622
699
697
647
646
695a

Fig 37

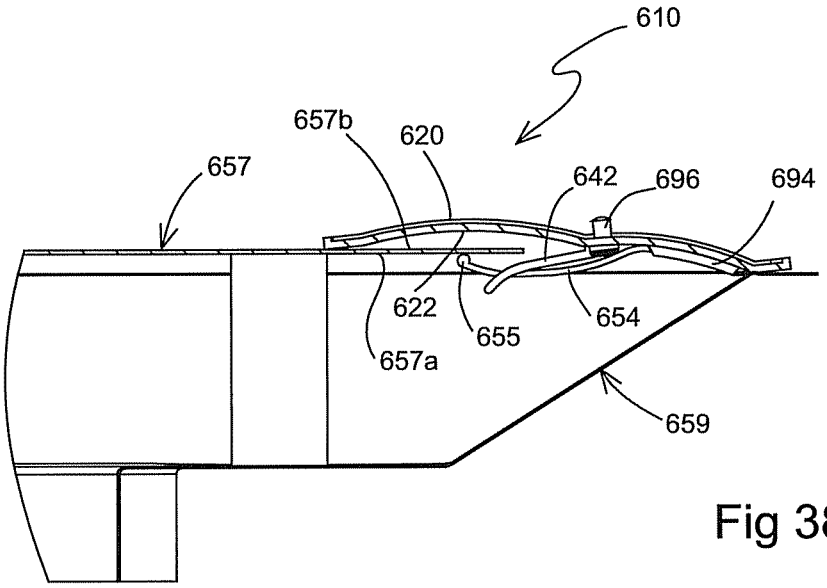


Fig 38

CEILING VENT DIFFUSER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation-in-Part of U.S. patent application Ser. No. 12/062,239 filed Apr. 3, 2008, the entire specification of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Technical Field

This invention generally relates to air circulation systems for buildings. More particularly, the invention relates to ceiling vents. Specifically, the invention relates to a cover that is detachably connectable to a ceiling vent diffuser to block airflow from a region of the diffuser.

2. Background Information

Most industrial and commercial buildings have 24"×24" square ceiling vent diffusers that are mounted on drywall or T-bar ceilings. Occasionally, buildings may be provided with circular vent diffusers, but these are less common than the square version. The vent diffusers are standardized to fit in the 24" T-bar ceiling spacing and can be made with three or four vents through which heated or cooled air is introduced into the room. The diffusers alter the direction of the air flowing out of the vent so that the air does not flow straight down into the room and at right angles to the ceiling. Instead, the diffuser causes the air to flow outwardly equally in all directions and through 360 degrees from the vent. Initially, the air is blown generally along a portion of a ceiling and eventually drops into the room at a distance from the vent itself.

When heating and air-conditioning contractors are designing and installing heating and cooling systems, their main focus is the overall balance of heating and cooling circulation in any particular area of the building. The contractor will add butterfly type air flow controllers in the pipe that connects to the top of the diffuser. The flow valves for the system are adjusted in an attempt to give the building as constant a temperature as possible. The contractors typically install, test and adjust the heating and cooling system before any furniture or employees are housed in the building. When employees are finally settled into the premises, they may discover that they have hot or cold air blowing directly onto them from vents located in close proximity to their desks. This situation may lead to much discomfort on the part of the employees who may try to minimize their discomfort by shutting the vent or taping cardboard or some other material over the same. Another possible solution is for a company that maintains the system to remove the diffuser and adjust the airflow butterfly valve to reduce the overall flow of air through the diffuser. This adjustment of the butterfly valve does not affect the direction of the flow but, instead, affects the volume of air flowing through the vent. This airflow reduction may make life more pleasant for the employee sitting close to the vent but it can also have negative implications for the overall temperature of the building.

There is therefore a need in the art for a device and method that allows for quick and easy adjustment of the airflow through a vent diffuser.

SUMMARY OF THE INVENTION

The device of the present invention comprises a cover that is selectively engageable with a vent diffuser to allow for directional adjustment of the airflow through the vent without affecting the volume of air flowing outwardly from the same.

The device comprises a flexible member that is secured to a diffuser vane by a spring-biased hook member and one or more tabs. A release button on the outer surface of the device is depressed to pivot the hook member out of engagement with the vane.

The device is complementary shaped to a region of the diffuser. If a typical square diffuser is viewed from the position of the mouth of the vent pipe to which the diffuser is attached, then the diffuser may be considered to have four directional quadrants out of which air flows. Those quadrants are effectively directed toward the north, the south, the east and the west. Under normal operating conditions, air radiates outwardly and downwardly from the vent and through the diffuser in all four quadrants. The device of the present invention provides a mechanism for blocking airflow in a selected one of the quadrants. When installed, the device blocks the openings in that region and substantially prevents air from flowing out of the openings. The device can be quickly and easily installed and removed and thereby allows for rapid blocking of the airflow in any one direction from the diffuser. The airflow out of the remaining three quadrants is increased proportionately, but the overall volume of air flowing out of the vent is not reduced. Consequently, the airflow at a particular workstation, for example, may be effectively blocked, but the overall temperature of the building is relatively unaffected.

One or more devices may be installed in selected regions to block airflow from those selected regions. A plurality of devices may be utilized to completely prevent airflow from the diffuser.

In alternative embodiments of the invention, the hook member is provided with two or more engagement regions which enable it to engage vanes on different manufacturer's diffusers. The first end of the hook member is either pivotally secured to the flexible member or is engaged in an adjustment mechanism thereon. The adjustment mechanism allows the first end of the hook member to be reciprocally moved along a channel in the adjustment mechanism which then causes the second end of the hook to be situated in different positions relative to an interior edge of the flexible member. This enables the installer to install the flexible member on differently configured diffusers. An extension member is detachably engaged with the flexible member to increase the overall size thereof to accommodate larger diffusers. The extension member is easily removed to reduce the size of the diffuser. The hook member may further include a second end that is curved toward the inner surface of the flexible member and is biased toward the same.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments of the invention, illustrative of the best mode in which applicant has contemplated applying the principles, are set forth in the following description and are shown in the drawings and are particularly and distinctly pointed out and set forth in the appended claims.

FIG. **1** is a perspective front view of a four-vane diffuser installed on a ceiling, with the diffuser having a cover in accordance with the present invention installed thereon;

FIG. **2** a perspective front view of the four-vane diffuser taken from a slightly different angle with the ceiling removed for clarity, and showing the openings between the vanes of the vent diffuser;

FIG. **3** is a front view of the vent cover in accordance with the present invention;

FIG. **4** is a side view of the vent cover of FIG. **3**;

FIG. **5** is an end view of the vent cover;

FIG. **6** is a perspective rear view of the vent cover showing the locking mechanism;

FIG. **7** is a perspective front view of the vent cover showing the release button extending from the outer surface of the cover;

FIG. **8** is a second perspective front view of the vent cover showing the leg and hook member of the locking mechanism extending rearwardly from the cover;

FIG. **9** is an exploded rear view of the vent cover;

FIG. **10** is a front view of the diffuser with the vent cover installed thereon;

FIG. **11** is a side view of the diffuser and vent cover taken through line **11-11** of FIG. **10**;

FIG. **12** is an enlargement of the highlighted region of FIG. **11** and showing a portion of the vent cover in cross-section;

FIG. **13** is a front view of the vent diffuser without a cover installed thereon and showing the airflow pattern from the diffuser;

FIG. **14** is a front view of the vent diffuser with a cover installed thereon and showing the airflow pattern from the diffuser;

FIG. **15** is a perspective front view of a three-vane diffuser with the vent cover installed thereon;

FIG. **16** is a perspective front view of the three-vane diffuser taken from a slightly different angle and showing the vent cover installed thereon;

FIG. **17** is a front view of the three-vane diffuser with the vent cover installed thereon;

FIG. **18** is a side view of the diffuser and vent cover taken through line **18-18** of FIG. **17**;

FIG. **19** is an enlargement of the highlighted region of FIG. **18**;

FIG. **20***a* is a perspective rear view of a second embodiment of a vent cover in accordance with the present invention showing a second type of locking mechanism provided on the cover;

FIG. **20***b* is a perspective front view of the cover of FIG. **20***a;*

FIG. **21** is a side view of the vent cover of FIG. **20***a;*

FIG. **22** is an enlarged side view of the highlighted region of FIG. **21**;

FIG. **23***a* is an enlarged side view of the highlighted region of FIG. **21** and showing a vane of a first diffuser captured in the stepped hook member of the cover; and

FIG. **23***b* is an enlarged side view of the highlighted region of FIG. **21** and showing a vane of a differently configured second diffuser captured in a different location in the stepped hook member of the cover;

FIG. **23***c* is an enlarged side view of the highlighted region of FIG. **21** showing the angles between the various faces on the stepped hook member;

FIG. **24** is a perspective rear view of a third embodiment of a cover in accordance with the present invention and showing an extension member engaged therewith;

FIG. **25** is a front elevational view of the cover of FIG. **24**;

FIG. **26** is a cross-sectional side view of the cover taken through line **26-26** of FIG. **25**;

FIG. **27** is an enlarged side view of the highlighted region of FIG. **26**;

FIG. **28** is an exploded perspective front view of the cover and the extension member;

FIG. **29** is a rear elevational view of the extension member; and

FIG. **30** is a front elevational view of a ceiling vent diffuser having the third embodiment of the vent cover in accordance with the present invention engaged therewith;

FIG. **31** is a perspective rear view of a fourth embodiment of a cover in accordance with the present invention and showing an adjustable hook member which is provided with a locking mechanism to engage the hook member in a particular position on the cover;

FIG. **32** is a side view of the cover of FIG. **31**;

FIG. **33***a* is an enlarged rear view of the highlighted region of FIG. **31**;

FIG. **33***b* is an enlarged rear view of the highlighted region of FIG. **31** with the hook member exploded outwardly away from the flexible member and adjustment mechanism;

FIG. **34** is a cross-sectional side view of the locking mechanism shown in FIG. **33**;

FIG. **35** is a perspective rear view of the cover of FIG. **31** with the hook member adjusted to a second position on the locking mechanism that is different to that shown in FIG. **31**;

FIG. **36** is a perspective rear view of a fifth embodiment of a cover in accordance with the present invention and showing another version of an adjustable hook member;

FIG. **37** is a perspective rear view of a sixth embodiment of a cover in accordance with the present invention that is configured to engage a panel-type diffuser, and showing yet another version of an adjustable hook member; and

FIG. **38** is a cross-sectional side view of the sixth embodiment of the cover shown engaged with a panel-type diffuser.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. **1-14** there is shown a vent diffuser cover in accordance with the present invention and generally indicated at **10**. Cover **10** is designed to be engaged with a vent diffuser **12** to change the airflow pattern therefrom. The vent diffuser **12** is positioned in front of a vent (not shown) in the ceiling **14** and typically is either square or circular in shape. Diffuser **12** is shown as having four vanes **16** and openings **18** therebetween through which air can flow.

In accordance with a specific feature of the present invention, cover **10** comprises a flexible member **20** that preferably is manufactured from a plastic material. Flexible member **20** may be transparent so that it is not easily noticed on vent diffuser **12** or may be opaque and colored so that it blends into vent diffuser **12** or colored so that it is easily seen.

Flexible member **20** has an inner surface **22**, an outer surface **24**, interior edge **26**, exterior edge **28** and side edges **30**. Interior edge **26** is shorter in length than is exterior edge **28**. Consequently, flexible member **20** tapers from exterior edge **28** to interior edge **26** and has the shape of a truncated triangle.

As shown in FIG. **6**, flexible member **20** is generally planar but is molded to have a first region **32** and a second region **34** that meet along a shallow ridge **36**. Each of the first and second regions **32**, **34** has a shallow arcuate profile when viewed from the side. This configuration of first and second regions **32**, **34** gives flexible member **20** a spring memory. Interior edge **26** is thinned slightly relative to the rest of flexible member **20**, thereby creating a lip **38** that runs along the entire length of interior edge **26**. Lip **38** forms a part of outer surface **24** of flexible member **20**. A seal, comprising an adhesive foam strip **40**, is secured to inner surface **22** of flexible member **20** and along exterior edge **28** thereof.

One or more tabs **42** are provided on inner surface **22** of cover **10**. Tabs **42** extend from inner surface **22** and are spaced apart from each other. Preferably tabs **42** extend outwardly from inner surface **22** and proximate ridge **36**. At least a portion of each tab **42** is spaced a distance from inner surface **22** and is substantially parallel therewith. Consequently, a gap **44** is formed between each tab **42** and inner surface **22**. Tabs

42 extend toward interior edge 26 of cover 10 and are provided to engage an outer edge of one of vanes 16 on vent diffuser 12, as will be hereinafter described.

Cover 10 is also provided with a locking mechanism for securing it to vent diffuser 12. The locking mechanism comprises an articulated hook member 46 that is engaged with flexible member 20. An aperture 48 is defined in first region 32 of flexible member 20. At least one first mounting bracket 50 extends outwardly from inner surface 22 of flexible member 20 adjacent a first end of aperture 48. At least one second mounting bracket 52 extends outwardly from inner surface 22 of flexible member 20 adjacent a second end of aperture 48. Hook member 46 is a generally L-shaped member having a first end 46*a* (FIG. 9) that is pivotally secured to first mounting bracket 50 and a second end 46*b* remote from said first mounting bracket 50. Second end 46*b* includes a leg 54 that extends inwardly toward inner surface 22 of flexible member 20 when hook member 46 is secured to first mounting bracket 50. Leg 54 extends outwardly from second end 46*b* at an angle of between 80 degrees and 120 degrees to the longitudinal axis "Y" thereof. Hook member 46 is also provided with an arm 56 that extends toward inner surface 22 of flexible member 20. Hook member 46 is spaced a distance inwardly from first end 46*a*. Arm 56 extends outwardly from hook member 46 at an angle of between 70 degrees and 120 degrees to the longitudinal axis Y. As shown in FIG. 9, leg 54 and arm 56 extend outwardly from hook member 46 in opposite directions to each other. An end of arm 56 projects through aperture 48 in flexible member 20 and extends for a short distance beyond outer surface 24 thereof. A rubber cap 58 is provided for the end of arm 56. As shown in FIG. 9, cap 58 preferably includes a lip 60 that abuts inner surface 22 of flexible member 20 and a cup region 62 that retains the end of arm 56 therein. Cup region 62 projects outwardly through aperture 48. Cup region 62 and the end of arm 56 retained therein form a release button that is engageable to manipulate the position of hook member 46. A spring 64 is secured at one end to second mounting bracket 52 and at another end is received through hole 66 (FIG. 9) in hook member 46. Spring 64 is provided to keep leg 54 of hook member 46 biased toward inner surface 22 of flexible member 20.

Cover 10 is installed on vent diffuser 12 quickly and easily. In order to install cover, flexible member 20 is slid onto vent diffuser 12 from one side with cover 10 being held at an upward angle so that hook member 46 and tabs 42 slide between first and second vanes 16*a*, 16*b* (FIGS. 1, 2 and 12). As shown in FIG. 12, tabs 42 engage the outermost edge of first vane 16*a*. More specifically, tabs 42 slide under the bottom surface of the outermost edge of first vane 16*a* thereby causing the outermost edge of first vane 16*a* to be captured between tabs 42 and inner surface 22. Leg 54 of hook member 46 engages the innermost edge of the first vane 16 and becomes engaged thereunder. Lip 38 of interior edge 26 slides over the bottom surface of the outermost edge of second vane 16*b*. Because of the shape of flexible member 20 with the slight arcuate bowing of first and second regions 32, 34, the spring memory in the plastic of member 20 keeps lip 38 forced against the second vane 16*b*. Foam strip 40 is seated on the outermost surface of rim 68 of vent diffuser 12. Strip 40 acts as a seal to substantially prevent air from flowing between cover 10 and rim 68. Strip 40 also acts as a dampener and substantially prevents cover 10 from vibrating and rattling against vent diffuser 12 when air flowing through diffuser 12 buffets cover 10. Cover 10 is therefore seated over the exterior surface of diffuser in such a manner that it substantially blocks off openings 18 between vanes 16 in the region of vent diffuser 12 over which it is applied. The person installing cover 10 will be able to confirm that flexible member 20 is secured onto diffuser 12 because the release button formed by arm 56 and cap 58 extends outwardly from outer surface 24 to a greater degree than when cover 10 is detached from diffuser 12.

Cover 10 is designed to affect airflow from diffuser 12. FIG. 13 shows diffuser 12 before a cover 10 is installed thereon. Diffuser 12 is shown divided generally into four quadrants that are labeled A, B, C and D. The arrows illustrate air flowing out of vent diffuser 12 in all four quadrants. FIG. 14 shows vent diffuser 12 after cover 10 has been installed in one quadrant thereof. In this figure, quadrant A has been closed off by cover 10. It can be seen that the airflow from vent diffuser 12 has been changed in that air no longer flows out of quadrant A, but continues to flow out of quadrants B, C, and D. Furthermore, while quadrant A is blocked off, the rate of air flowing out of the vent diffuser 12 does not change but the volume and rate of airflow from the remaining quadrants B, C and D is increased relative to the condition shown in FIG. 13. This increase in the rate of airflow is signified by the larger arrows in FIG. 14. It will be understood that more than one cover 10 may be applied to vent diffuser 12 to change the airflow therefrom. If four separate covers are installed on vent diffuser 12, airflow from vent diffuser 12 will be substantially completely cut off.

When it is desired to remove cover 10, the cap 58 is pushed inwardly toward outer surface 24 of flexible member 20. This inward movement causes hook member 46 to pivot about the connection point of hook member 46 with second mounting bracket 52. Leg 54 is thereby moved outwardly away from the innermost edge of first vane 16*a* and becomes disengaged therefrom. Cover 10 may then be slid off vent diffuser 12.

FIGS. 15-19 show cover 10 installed on a vent diffuser 112 that has three vanes 116 instead of four. Vanes 116 have openings 118 between them through which air can flow. Cover 10 is exactly the same cover that is applied to vent diffuser 12. Lip 38 slides over the exterior surface of vane 116*b*. Tabs 42 slide under the bottom surface of the outermost edge of vane 116*a* while leg 54 engages the bottom surface of the innermost edge of vane 116*a*. Strip 40 rests on rim 168 of diffuser 112. Cover 10 is applied to diffuser 112 in the same manner as to diffuser 12. Cover 10 is also removed therefrom in like manner.

Cover 10 is of a truncated triangular shape so as to be complementary to the shape of a quandrant of a square diffuser 12. It will be understood that the cover can be manufactured to be complementary to a region of a round diffuser (not shown). This cover may be designed to block one quarter of a round vent diffuser or one third of a round vent diffuser. In the first instance, the cover is designed to block off 90° of the vent diffuser and four covers will completely prevent airflow from the vent diffuser. The cover may, instead, be designed to block off 120° of the round vent diffuser. In this instance, three covers may be used to completely prevent airflow from the vent diffuser.

Referring to FIGS. 20-23*b* there is shown a second embodiment of a vent cover in accordance with the present invention and generally indicated at 110. Vent cover 110 is substantially identical to vent cover 10 and includes a flexible member 120 positionable to be seated over an exterior surface of a vent diffuser and to thereby obstruct a region of the diffuser to substantially prevent airflow from that obstructed region. Flexible member 120 has an inner surface 122, an outer surface 124, an interior edge 126, an exterior edge 128 and side edges 130 extending between the interior and exterior edges 126, 128. Flexible member 120 tapers from exterior edge 128 to interior edge 126 and has the shape of a

truncated triangle. Flexible member **120** comprises two gently curved or pillowed regions, namely first region **132** and second region **134** that meet along a shallow ridge **136**. The term "pillowed" is used to describe a cross-sectional shape that is generally planar but includes a very gentle curve. This pillowed-type design gives cover **110** an increased strength and flexibility that enables it to be detachably engaged with a wide variety of different manufacturer's ceiling vent diffusers. As with vent cover **10**, this configuration of first and second regions **132**, **134** also gives flexible member **120** a spring memory which aids in keeping it interlockingly engaged with a ceiling diffuser.

As best seen in FIG. **20***b*, cover **110** further preferably includes a lip **180** on outer surface **124** and which extends around the periphery of cover **110** and is disposed adjacent interior edge **126**, exterior edge **128** and side edges **130**. Lip **180** projects for a distance above outer surface **124**. It will be understood that lip **180** could also be configured to project for a distance below inner surface. Lip **180** provides additional strength to cover **110**. A sealing member, such as adhesive foam strip **140**, may be secured to inner surface **122** and along exterior edge **128**. It will be understood, however, that the sealing member **140** may be omitted without departing from the scope of the present invention.

Cover **110** is provided with a locking mechanism which aids in detachably retaining flexible member **120** on a vent diffuser. The locking mechanism includes a connector member and a hook member. The connector member preferably engages a region on a vane of the vent diffuser and the hook member preferably engages a different region of that vane.

In particular, the connector member comprises one or more tabs **142** which are each fixedly secured to the inner surface **122** and extend outwardly therefrom. Tabs **142** serve much the same function as tabs **42** but the configuration of tabs **142** differs from that of tabs **42**. Tabs **142** extend outwardly from inner surface **122** and at an angle relative thereto and extend toward interior edge **126**. A gap **144** is defined between tab **142** and inner surface **122**. Tabs **142** in combination with inner surface **122** of flexible member **120** are configured and oriented so as to receive an edge of one of the vanes of a ceiling diffuser in gap **144** and to retain the same therein. Tabs **142** preferably are about 2-4 inches (5½ cm-7½ cm) in length and are about 1 inch (2.5 cm) in width. Each tab **142** includes a first section **142***a* that is spaced from inner surface **122** and is generally planar along its entire length. Preferably, first section **142***a* is between ¾ inch to 2 inches (2 cm-4 cm) long. First section **142** extends outwardly from inner surface **122** at an angle of about 10° to 15° relative to inner surface **122**. The second region **142***b* of each tab **142** curves downwardly and outwardly away from inner surface **122** so that the tip region is at an angle of about 20° relative to inner surface **122**. The shape and increased angle of the curved second region **142** aids in helping tab **142** slide more easily into position on the vanes of a wide variety of different manufacturer's diffuser vanes. Tabs **142** are used to secure flexible member **120** to a region of a vane of a ceiling vent diffuser in substantially the same way as tabs **42**. It will be understood that other suitable mechanisms for connecting the flexible member to one of the vanes in opposition to the hook member **146** can also be utilized in place of the tabs **142** without departing from the scope of the present invention.

As indicated previously, the locking mechanism on cover **110** also includes a hook member **146** which is biased toward inner surface **122**. In this second embodiment, hook member **146** is biased toward inner surface **122** by a spring **164**. Hook member **146** is substantially identical to hook **46** and includes one or more mounting brackets **150**, **152** which secure hook member **146** to inner surface **122**. Particularly, mounting brackets **150** are disposed proximate an aperture **148** (FIG. **20***b*) defined in flexible member **120**. Hook member **146** is, again, a generally L-shaped member having a shaft **147** with a first end **147***a* that is pivotally secured to mounting brackets **150**, **152** and thereby to inner surface **122**. The second end of shaft **147** comprises a leg **154** that extends inwardly toward inner surface **122** at an angle of between 80 degrees and 120 degrees relative to shaft **147**. It will be understood that leg **154** may be is disposed at any other suitable angle relative to shaft **147** without departing from the scope of the present invention. Hook member **146** further includes an arm **156** extending inwardly from shaft **147** and toward inner surface **122**. Arm **156** is spaced a distance along shaft **147** from first end **147***a* and extends outwardly from shaft **147** and at an angle of between 70 degrees and 120 degrees relative thereto. Again, it will be understood that arm **156** may be disposed at other suitable angles relative to shaft **147** without departing from the scope of the present invention. An end of arm **156** projects through aperture **148** of flexible member **120** and extends for a short distance beyond outer surface **124** thereof. A cap **162** preferably is provided on the end of arm **156**, although this cap **162** may be omitted. Cap **162** may be manufactured from molded plastic or any other suitable material.

As with the previous embodiment, the end of the arm **156** that projects beyond outer surface **124** is used to disengage hook member **146** from its interlocking engagement with a diffuser. As indicated previously, the locking mechanism further includes a spring **64** which is secured at one end to mounting bracket **152** and at another end is received through a hole in shaft **147**. Spring **164** keeps leg **154** of hook member **146** biased toward inner surface **122** of flexible member **120** and thereby keeps cover **110** retained on a ceiling diffuser once engaged therewith.

In accordance with a specific feature of the present invention, hook member **146** differs from hook **46** in that leg **154** is provided with a plurality of discrete engagement regions along the inside edge **154***a* thereof. Each separate engagement region comprises two faces that are set at an angle relative to each other and are oriented so that an edge of one of the vanes of a ceiling vent diffuser is captured in that angled region between the two faces. Different manufacturer's diffuser vanes are differently configured and the plurality of discrete engagement regions on hook member **146** ensures that edges of these differently configured vanes will be able to be engaged by a suitably situated and angled one of these engagement regions. One brand of diffuser will have a vane captured in the angled region of one engagement region while another brand of diffuser will have a vane captured in the angled region of a different engagement region. Thus, the same cover **110** can be used to affect airflow on a wide variety of different manufacturer's products.

The nature of the specially configured hook member **146** is illustrated in greater detail in FIGS. **22**-**23***b*. All of the faces of the plurality of engagement regions are provided on inside edge **154***a* of leg **154**. The outside edge **154***b* thereof is free of such faces. The specific number of discrete engagement regions provided on leg **154** and the length of the faces and the size of the angles that comprise the same may be varied without departing from the scope of the present invention. In a preferred embodiment of the invention, shown in FIG. **23***c*, inside edge **154***a* is provided with a first face **147***b* that is essentially a section of the inside edge of shaft **147**. Inside edge **154***a* further includes a second face **170***a*, a third face **170***b*, a fourth face **170***c*, a fifth face **170***d*, a sixth face **170***e*, a seventh face **170***f*, an eighth face **170***g*, a ninth face **170***h*, a tenth face **170***i* and an eleventh face **170***j*.

Referring to FIG. **23***c* it will be seen that second face **170***a* preferably is disposed at an angle of 87° relative to first face **147***b*; third face **170***b* preferably is disposed at an angle of 4° relative to first face **147***b*; fourth face **170***c* is disposed at an angle of 87° relative to first face **147***b*; fifth face **170***d* preferably preferably is disposed at an angle of 8° relative to first face **147***b*; sixth face **170***e* preferably is disposed at an angle of 82° relative to first face **147***b*; seventh face **170***f* preferably is disposed at an angle of 11° relative to first face **147***b*; eighth face **170***g* preferably is disposed at an angle of 81° relative to first face **147***b*; ninth face **170***h* preferably is disposed at an angle of 20° relative to first face **147***b*; tenth face **170***i* preferably is disposed at an angle of 72° relative to first face **147***b*; and eleventh face **170***j* preferably is disposed at an angle of 20° relative to first face **147***b*. It will be understood that these various angles are provided by way of example only. Other suitable angles between the first face **147***b* and the second through eleventh faces **170***a*-**170***j* may be used without departing from the scope of the present invention.

As indicated above, second face **170***a* extends outwardly from first face **147***a* and is disposed at a first angle "A" (FIG. **22**) relative thereto. The first face **147***b* and second face **170***a* form a first engagement region and an edge of a diffuser vane may be captured in the first angled region "A" between first face **147***b* and second face **170***b*.

Inside edge **154***a* is further provided with a second engagement region formed by third face **170***b* and fourth face **170***c* which are disposed at a second angle "B" relative to each other. An edge of the diffuser vane may be received in this second angled region "B" between third and fourth faces **170***b*, **170***c*. It should be noted that third face **170***b* preferably is substantially continuous with first face **170***a*. Thus, second engagement region is positioned on inside edge **154***a* adjacent first engagement region. Second engagement region may, however, be spaced a distance from first engagement region.

Inside edge **154***a* is further provided with a third engagement region disposed adjacent second engagement region. Third engagement region comprises fifth face **170***d* and sixth face **170***e* that are disposed at a third angle "C" relative to each other. The edge of the diffuser vane may be engaged in this third angled region "C" between fifth and sixth faces **170***d*, **170***e*.

Inside edge **154***a* is further provided with a fourth engagement region disposed adjacent third engagement region. Fourth engagement region comprises seventh face **170***f* and eighth face **170***g* that are disposed at a fourth angle "D" relative to each other. The edge of the diffuser vane may be engaged in this fourth angled region "D" between seventh and eighth faces **170***f*, **170***f*.

Inside edge **154***a* is further provided with a fifth engagement region disposed adjacent fourth engagement region. Fifth engagement region comprises ninth face **170***h* and tenth face **170***i* that are disposed at a fifth angle "E" relative to each other. The edge of the diffuser vane may be engaged in this fifth angled region "E" between ninth and tenth faces **170***h*, **170***i*.

All of these different faces **170***a*-**170***j* and the various angles between them provide cover **110** with a hook member **146** that appears to be stepped along the inside edge **154***a* of leg **154**. As indicated previously, these five engagement regions on leg **154** may be utilized by an installer to secure cover **110** to a wide range of differently configured diffusers. The stepped hook member **146** enables cover **110** to engage diffusers that have vanes which are spaced closer together or further away from each other, or that extend to varying distances and at different angles into the interior of the diffuser.

It will be understood that the angles between the various faces indicated above are by way of example only. Other suitable stepped arrangements with different sized angles between the various faces could be utilized depending on the specifications of the diffusers manufactured by different manufacturers. Other stepped configurations are contemplated to fall within the scope of the present invention.

FIG. **23***a* shows cover **110** engaged with a vane **116** of a first diffuser (not shown) and FIG. **23***b* shows cover **110** engaged with a vane **216** of a second and differently configured diffuser. Vane **116** is captured by the second engagement region on leg **154**, i.e. in the second angled region "B" defined by third face **170***b* and fourth face **170***c*. Vane **216** is captured by the fourth engagement region on leg **154**, i.e., vane **216** is received in the fourth angled region "D" between seventh face **170***f* and eighth face **170***g*. As is evident from these figures, vanes **116** or **216** become captured by the different engagement regions of hook member **146** based on the distance between the vanes and the angle that those vanes are oriented at in the two different diffusers. The methodology of engaging cover **110** onto a diffuser of any configuration and disengaging the same therefrom is substantially the same as was described with reference to cover **10**. Tab **142** captures a first edge of a vane in the gap between tab **142** and inner surface **122** of cover **110**. Leg **154** of hook member **146** is engaged over a second edge **116**, **216** of that same vane or of another vane in the diffuser and is thereby retained adjacent the exterior surface of the diffuser.

Referring now to FIGS. **24**-**30** there is shown a third embodiment of a vent cover in accordance with the present invention and generally indicated at **310**. Cover **310** is substantially identical to cover **110** in its structure, function and method of use with the exception that cover **310** also includes an extension member **372**. Vent cover **310** includes a flexible member **320** substantially identical to flexible member **220**, Flexible member **320** includes an inner surface **322**, an outer surface **324**, an interior edge **326** an exterior edge **328** and side edges **330** extending between the interior and exterior edges **326**, **328**. Flexible member **320** tapers from exterior edge **328** to interior edge **326** and has the shape of a truncated triangle. Flexible member **320** comprises two gently curved or pillowed regions, namely first region **332** and second region **334** that meet along a shallow ridge **336**. As best seen in FIG. **25**, cover **310** further includes a lip **380** on outer surface **324** and which extends around the periphery of cover **310** and is disposed adjacent interior edge **326**, exterior edge **328** and side edges **330**. Lip **380** projects for a distance above outer surface **324** and provides additional strength to cover **110**. A sealing member, such as adhesive foam strip **340**, may be secured to inner surface **322** and along exterior edge **328**.

Cover **310** is provided with a locking mechanism which aids in detachably retaining flexible member **320** on a vent diffuser. The locking mechanism includes a connector member and a hook member. The connector member may engage a region on a vane of the vent diffuser and the hook member may engage a different region of that vane. The connector member comprises one or more tabs **342** which are each fixedly secured to the inner surface **322** and extend outwardly therefrom. Tabs **342** are substantially identical in structure and function to tabs **142**. Hook member **346** is engaged with one or more mounting brackets **350** which secure hook member **346** to inner surface **322**. Hook member **346** is a generally L-shaped member having a shaft **347** that is pivotally secured to mounting brackets **350**. Shaft **347** includes a leg **354** that extends inwardly toward inner surface **322** in substantial the same manner as leg **154**. Hook member **346** further includes an arm **356** extending inwardly from shaft **347** and toward

inner surface **322**. An end of arm **356** projects through aperture **348** (FIG. **28**) of flexible member **320** and extends for a short distance beyond outer surface **324** thereof. A cap **362** preferably is provided on the end of arm **356**, although this cap **362** may be omitted. The end of the arm **356** that projects beyond outer surface **324** is used to disengage hook member **346** from its interlocking engagement with a diffuser. Locking mechanism includes a spring **364** which is secured at one end to mounting bracket **352** and at another end is received through a hole in shaft **347**. Spring **364** keeps leg **354** of hook member **346** biased toward inner surface **322** of flexible member **320** and thereby keeps cover **310** retained on a ceiling diffuser once engaged therewith. Hook member **346** is substantially identical in structure and function to hook member **146** and includes a number of faces **370** on engagement regions that are substantially identical in structure and function to faces **170***a*-**170***j*.

As indicated previously, cover **310** is substantially identical to cover **110** in its structure, function and method of use with the exception that cover **310** also includes an extension member **372**. Extension member **372** is selectively detachably engageable with flexible member **320** to increase the overall size of cover **310**. Specifically, extension member **372** is detachably engaged with flexible member **320** so as to increase the cover's length. The engagement of extension member **372** with flexible member **320** is desirable when the diffuser to which cover **310** is to be attached is larger in size. So, for example, if typical diffusers have three sets of vanes, a larger diffuser could have four sets of vanes. Cover **310** is able to be removed from the larger diffuser at a later date and extension member **372** may then be detached from its engagement with flexible member **320**. This disengagement reduces the cover's overall size to its original size and cover **310** may then be used again on smaller diffusers.

Extension member **372** has a first end **374**, a second end **376** and side edges **378**. Extension member **372** also has an inner surface **372***a* (FIG. **24**) and an outer surface **372***b* (FIG. **25**). As is evident from FIG. **26**, first end **374** of extension member **372** is of substantially the same width as interior edge **326** of cover **310**, where the width is that distance between the opposed side edges of the two components. Second end **376** is of a substantially smaller width so that extension member **372** tapers from first end **374** toward second end **376** thereof. Effectively, extension member **372** has a truncated triangular shape.

In accordance with a feature of the present invention and as best seen in FIG. **28**, a lip **380** is provided on the outer surface **324** substantially around the entire periphery of cover **310**. Lip **380** therefore extends around the periphery of interior edge **326**, exterior edge **328**, and side edges **330** thereof. Similarly, a lip **382** is provided on outer surface **372***b* of extension member **372**. Lip **382** extends around a portion of the periphery of extension, specifically along first end **374** and most of side edges **378**. Lip **382** does not extend along a region of each side edge **378** proximate second end **376** and along second end **376**. Additionally, as is evident from FIG. **28**, lip **382** tapers at ends **382***a*. This configuration gives extension member **372** a sleek second end **376** that conforms more readily to a diffuser's profile and aids in helping cover **310** to blend into diffuser so that the cover's presence is not readily detected by the casual observer.

In accordance with a specific feature of the present invention, extension member **372** is configured to interlockingly engage cover **310** and to be retained thereon until it is actively disengaged by a user. FIG. **28** shows some of the components that are provided on extension member **372** to interlockingly engage cover **310**. First end **374** of extension member **372** includes a lower flange **384** that runs along a lowermost region of first end. Lower flange extends outwardly from lower surface **372***a* of extension member **372** and extends outwardly beyond first end **374**. One or more slots **386** are provided in lower flange **384**, each slot being spaced a distance inwardly from one of the side edges **378** of extension member **372**. One or more upper flanges **388** extend outwardly from upper surface **372***b* of extension member **372** and these flanges **388** extend beyond first end **374** in the same general direction as lower flange **384**. It should be noted that each upper flange originates in upper surface **372***b* and extends over lip **382**. Since extension member **372** is a molded plastic product, upper surface **372***b*, upper flange **388** and lip **382** are all integrally joined to each other. Each upper flange **388** is provided in the region immediately above one of slots **386** in lower flange **384**. When viewed from the side, a gap **390** is defined between upper flange **388** and lower flange **384**.

As best seen in FIG. **27**, the outermost tip of upper flange **388** is tapered and forms an interior shoulder **389** which projects downwardly into gap **390**. A slot **392** is defined in lower surface **372***a* of extension member **372**, a short distance inwardly from portion of the lower flange **384** which defines slot **386**. Slot **392** is in communication with gap **390** and is situated directly beneath an interior region of upper flange **388** and inwardly of shoulder **389**. As shown in FIG. **29**, slot **392** is provided in lower surface **372***a* of extension member **372** and is oriented substantially parallel to the outermost edge **384***a* of lower flange **384**. Slots **392** extend for substantially the same distance "D" as the width of each upper flange **388**.

When flexible member **320** and extension member **372** are engaged together, interior edge **326** of cover **310** is received in gap **390** between upper and lower flanges **388**, **384** such that lip **382** becomes interlocked with shoulder **388** therein. Cover **310** and extension member **372** are pushed inwardly toward each other until lip **380** and interior edge **326** of cover **310** snap-fit into gap **390**. Shoulder **389** interlocks with lip **380** on flexible member **320**. The engagement is sufficiently strong enough that the cover **310** and extension member remain engaged therewith and the two components cannot be pulled apart from each other without taking additional steps. The engagement is strong enough that cover **310** and extension member **372** remain together during installation of cover **310** on a diffuser and during periods when air flows out of the diffuser, contacts cover **310** and extension **372** and is deflected thereby. Extension **372** is engaged with cover **310** when the user wishes to utilize cover **310** on a diffuser that is larger and includes additional vanes and openings that need to be covered during operation.

When the user wishes to disengage extension **372** from cover **310**, they simply slide cover **310** and extension member **372** in opposite lateral directions relative to each other. This motion causes interior edge **326** of cover **310** to slide out of gap **390**, thereby allowing cover **310** and extension member **372** to separate from each other. Alternatively, the user can insert a narrow implement, such as the head of a flathead screwdriver into slot **392** and push the same gently upwardly until the head contacts upper flange **388**. This pushing motion will cause upper flange to move upwardly away from lower flange **384**, thereby enlarging gap **390** to a degree sufficient to allow lip **380** to disengage from shoulder **389**. The user is then able to slide interior edge **326** of cover **310** out of gap **390** in a longitudinal direction instead of a lateral direction because shoulder **389** is no longer in contact with lip **380**. Cover may then be used again without the extension member **372** to cover a smaller size diffuser.

It will be understood that instead of extension member **372** being configured to engage with the interior edge **326** of flexible member **320**, it may, alternatively, be configured so that it can be detachably engaged with the exterior edge **328** of flexible member. In this instance, first end **374** of extension member **372** would be of a width that is substantially the same as exterior edge **328** of flexible member **320** and second end **376** of extension member **372** would be substantially wider than the first end **374**. Exterior edge **328** would be snap-fitted into gap **390** of the connector assemblies **388** and would be frictionally retained therein until extension member **372** is disengaged from flexible member **320**. This configuration of extension member **372** and flexible member **320** will be engaged with a ceiling vent diffuser in substantially the same manner as the configuration in which the extension member **372** engages interior edge **326** of flexible member.

While the attached figures have illustrated the extension member **372** being engaged with flexible member **320**, it will be understood that it could similarly be engaged with flexible member **20** without departing from the scope of the present invention. In fact, extension member **372** may be engaged with any of the differently configured flexible members disclosed herein. If flexible member **20**, for example, is not manufactured to form a lip that will interlockingly engage with the shoulder of the upper flange, the interior or exterior edge **26**, **28** of the flexible member **20** will simply be retained by friction in the gap of the connector assembly on extension member **372**.

FIG. **14** shows cover **10** engaged with vent diffuser **12** and FIG. **30** shows cover **320** engaged with vent diffuser **312**. As is evident from these figures, vent diffuser **312** includes one additional vane relative to diffuser **12**. If cover **320** did not include extension member **372**, then opening between the first vane **312***a* and the second vane **312***b* would not be obstructed and air would flow outwardly through that opening. Because of the inclusion of extension member **372** to increase the overall size of cover **320**, all airflow through quadrant "A" of diffuser **312** is substantially blocked. Consequently, air flows out of the diffuser **312** through quadrants "B", "C", and "D" only. It should be noted that first end **376** of extension member **372** is slipped under the central region of diffuser **312** and is therefore not visible in FIG. **30**.

Referring to FIGS. **31-35**, there is shown a fourth embodiment of a vent cover according to the present invention and generally indicated at **410**. Cover **410** includes a flexible member **420** having the pillowed design of cover **110** and is comprised of a first region **432** and a second region **434** which join each other along a shallow ridge **436**. Cover **410** is shown free of a foam strip similar to strip **142** but it will be understood that if certain manufacturer's diffusers require it, such a strip could readily be applied to exterior edge **428** thereof. As with the previously described embodiments, cover **410** also includes an interior edge **426** and opposed side edges **430**, an inner surface **422** and an outer surface **424**.

In accordance with a specific feature of the present invention, cover **410** includes yet another embodiment of a locking mechanism. The locking mechanism in accordance with the present invention includes one or more tabs **442** which extend outwardly from inner surface **422** of cover **410**. Tabs **442** are substantially identical in structure and function to tabs **142**. The locking mechanism further includes a hook member **446** which extends outwardly away from inner surface **422** of flexible member **420**. Hook member **446** includes a shaft **447** having a first end **447***a* and a second end **447***b*. A leg **454** is provided at second end **447***b* of shaft **447** and the leg **454** extends inwardly toward inner surface **422**. At least a portion **447***c* of shaft **447** is curved away from inner surface. Hook member **446** is fabricated as a single piece and is configured so that it possesses an inherent spring memory which biases leg **454** toward inner surface **422**. The locking mechanism further includes an adjustment mechanism **494** which is fixedly secured to inner surface **422** of flexible member **420**.

Adjustment mechanism **494** includes a first guide **495***a* and a second guide **495***b*. First and second guides **495***a*, **495***b* are disposed substantially at right angles to interior edge **426** and are spaced laterally from each other. Thus, a channel **497** is defined between first and second guides **495***a*, **495***b* and first end **447***a* of hook member **446** is received in this channel **497**. An insert **498** extends between first and second guides **495***a*, **495***b*. A stop **499** extends outwardly from an outer surface of insert **498** and projects into the channel **497**. As is shown in FIGS. **33***a*, **33***b*, first end **447***a* of hook member **446** defines a longitudinally extending slot **447***d* comprised of a series of circular apertures which are in communication with each other. This series of apertures provides a plurality of different positions for receipt of stop **499** therethrough.

First end **447***a* of hook member **446** is engaged with adjustment mechanism **494** in such a way that hook member **446** is movable within adjustment mechanism **494** between at least a first position (FIG. **33**) and a second position (FIG. **35**). When hook member **446** is in the first position then leg **454** is disposed in a first location "L**1**" (FIG. **33**) relative to interior edge **426** and to inner surface **422**. Specifically, the tip of leg **454** is disposed a first distance away from inner surface **422**. When hook member **446** is in the second position, then leg **454** is disposed in a second location "L**2**" (FIG. **35**) relative to interior edge **426** and to inner surface. Specifically, the tip of leg **454** is disposed a second distance away from inner surface **422** because the curvature of hook member **426** causes the leg **454** to be moved further outwardly away from inner surface as the first end **447***a* thereof is moved toward interior edge **426**. If first end **447***a* is moved once again in adjustment mechanism **494** in the opposite direction from that shown in FIG. **38**, i.e., away from interior edge **426** and toward exterior edge **428**, then the leg **454** will once again be moved closer to inner surface **422**. This adjustability in the device enables the installer to change the effective depth (relative to inner surface **422**) that leg **454** is set at in order to engage different configurations and styles of diffuser. The position of first end **447***a* of hook member **446** within adjustment mechanism **494** is adjusted by engaging stop **499** in a different one of the plurality of apertures that form slot **447***d*. The engagement of stop **499** prevents any further movement in hook member **446** without the express intervention of the installer.

Thus, when an installer discovers that they are unable to adequately engage cover **410** on a vent diffuser because leg **454** of hook member **446** is not quite in the correct position, they are able to simply release stop **499** from its engagement in a particular one of the apertures of slot **447***d*, slide first end **447***a* of hook member **446** along channel **497** and engage stop **499** in a different one of the apertures of slot **447***d*. Once hook member **446** is positioned in an appropriate location on flexible member **420** the installer can then engage cover **410** on a vane of a diffuser. This adjustability of the position of hook member **446** relative to flexible member **420** enables the user to utilize cover **410** on a wide variety of different styles and sizes of ceiling vent diffusers.

When it is desired to remove cover **410** from engagement with a vane of a diffuser, the installer simply depresses a release button **496** on outer surface **424** of cover **410**. Button **496** is pushed inwardly in the direction of the arrow in FIG. **34**. The movement causes hook member **446** to be pushed

away from inner surface **422** of flexible member **420**, thus disengaging leg **454** of hook member **446** from the vane to which it was attached.

FIG. **36** illustrates a fifth embodiment of a vent cover in accordance with the present invention and generally indicated at **510**. Cover **510** is substantially identical to cover **410** with the exception that the locking mechanism provided therewith is different. The locking mechanism includes tabs **542**, an adjustment mechanism **594** and a hook member **546**. Tabs **542** are substantially identical in structure and function to tabs **142**. Adjustment mechanism **594** is substantially identical in structure and function to adjustment mechanism **494**. Hook member **546** differs from hook member **446**. Hook member **546** includes a shaft **547** that is similar to shaft **447** in that while it has first end **547***a* substantially identical to first end **447***a*, its second end is provided with a leg **554** that is substantially identical to leg **154** instead of to leg **454**. Adjustment mechanism **594** permits the position of hook member **546** to be adjusted so that an appropriate one of the engagement regions **570** on leg **554** will be in the correct location relative to interior edge **526** of flexible member **520** so as to engage a vane of a particular diffuser (not shown). The installer will make the appropriate adjustment of hook member **546** prior to engaging cover **510** on vane of that particular diffuser. The locking mechanism further includes a release button **596** which extends through an aperture in flexible member **520** and is accessible to the installer on the outer surface thereof. Release button **596** is substantially identical in structure and function to release button **496**.

FIGS. **37** and **38** show a sixth embodiment of a cover in accordance with the present invention and generally indicated at **610**. Cover **610** is configured to engage a panel type diffuser **659** as opposed to a vane-type of diffuser. Cover **610** is substantially identical in structure and function to cover **510** with the exception that it once again includes a different locking mechanism. The locking mechanism includes tabs **642** that are substantially identical in structure and function to tabs **142**. The locking mechanism further includes an adjustment mechanism **694** and a hook member **646**. The adjustment mechanism includes first and second guides **695***a*, **695***b* which are disposed substantially at right angles to interior edge **626** of flexible member **620**. A channel **697** is defined between first and second guides **695***a*, **695***b* and first end **647***a* of hook member **646** is received in channel **697**. Adjustment mechanism **694** further includes a lock **699** that secures first end **647***a* of hook member **646** in any one of a number of positions within channel **697**. Additionally a release button **696** is provided on cover **610**. Release **696** is substantially identical to release **596** in both structure and function.

Hook member **646** also includes a differently configured second end **654** from those previously disclosed herein. In this instance, hook member **646** includes a shaft **647** with a differently configured leg **654** extending outwardly from a second end of the shaft **647** and toward inner surface **622** of flexible member **520**. Specifically, leg **654** is concavely curved and disposed opposite inner surface **622** of flexible member **620**. The outermost end of leg **654** includes a crossbar **655** oriented substantially at right angles to a longitudinal axis of shaft **647**, although any other orientation of the crossbar relative to the longitudinal axis is considered to fall within the scope of the present invention. Crossbar **655** is configured to abut a region of the underside **657***a* (FIG. **38**) of a panel **657** on a panel diffuser **659** and to clamp the flexible member **620** against the upper side **657***b* of that panel **657**. A rubber covering may be applied over crossbar **655** to increase the friction between the hook member **646** and the panel **657**. In this instance, tabs **642** are not necessarily used to engage the panel.

Additionally, hook member **646** preferably is manufactured so that it can slide completely out of channel **697** of adjustment mechanism **694**. This allows the installer to completely detach hook member **646** from cover **610** and to replace it with a differently configured hook member such as one that includes a leg having multiple engagement regions thereon. The replacement hook member is inserted into channel **697** of adjustment mechanism **694** and is secured in an appropriate location therein so that the cover is able to be engaged with a completely differently shaped or sized diffuser. The cover **610** may therefore form part of a kit, being sold together with a range of differently configured hook members. This will enable the installer to select the best hook member for any particular type of diffuser they encounter on the job site.

It will be understood that the diffuser to which the cover of the present invention is being attached may be of any configuration. For example, the diffuser may be square or circular in shape but could be of any other shape. The cover of the present invention is configured to be complementary in shape to the particular design of diffuser to which it is to be attached. So, for example, in the substantially square diffusers illustrated herein, the longitudinal edges of the cover that are to be secured thereto are straight. If the diffuser was circular, then the edges of the cover would be curved. It will be understood that any other configuration of diffuser will be matched by a complementary configuration of the cover to be engaged therewith.

In the foregoing description, certain, terms have been used for brevity, clearness, and understanding. No unnecessary limitations are to be implied therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is an example and the invention is not limited to the exact details shown or described.

The invention claimed is:

1. A device for altering the airflow pattern from a vent diffuser that includes one or more vanes, an interior surface, an exterior surface and one or more openings through which air flows from the interior surface of the diffuser to the exterior surface thereof said device comprising:

a flexible member having an inner surface and an outer surface;

a locking mechanism provided on the inner surface of the flexible member and being adapted to detachably retain the flexible member on the vent diffuser such that the flexible member obstructs at least one opening in a region of the vent diffuser and thereby substantially prevents airflow from that obstructed region; and wherein the locking mechanism includes:

a hook member having a first end adjacent the inner surface of the flexible member and a second end remote therefrom; and wherein the hook member extends outwardly from the inner surface and wherein the second end of the hook member extends toward the inner surface of the flexible member and includes a first engagement region and a second engagement region, and wherein the second end of the hook member is adapted to engage one of the vanes of the vent diffuser in one of the first engagement region and the second engagement region; and

an adjustment mechanism provided on the inner surface of the flexible member; wherein the adjustment mechanism defines a channel therein which extends for a dis-

tance along the inner surface of the flexible member and the channel has a length and a width and wherein the first end of the hook member is engaged in the channel of the adjustment mechanism and is selectively movable along the length of the channel and across the inner surface of the flexible member between a first position and a second position; and, when the first end of the hook member is in the first position, the second end of the hook member is disposed in a first location set at a first distance relative to the inner surface of the flexible member; and when the first end of the hook member is in the second position, the second end of the hook member is disposed in a second location set at a second distance relative to the inner surface of the flexible member.

2. The device as defined in claim **1**, wherein the first engagement region comprises:

a first face; and

a second face, wherein the second face is disposed at a first angle relative to the first face; and wherein the first engagement region is adapted to selectively receive a first edge of the one of the vanes of the vent diffuser in a first angled region between the first and second faces.

3. The device as defined in claim **2**, wherein the second engagement region comprises:

a third face; and

a fourth face, wherein the fourth face is disposed at a second angle relative to the third face; and wherein the second engagement region is adapted to selectively receive the first edge of the one of the vanes of the vent diffuser in a second angled region between the third and fourth faces.

4. The device as defined in claim **3**, further comprising a third engagement region that is adapted to selectively engage the first edge of the one of the vanes of the vent diffuser therein, and wherein the third engagement region comprises:

a fifth face; and

a sixth face, wherein the sixth face is disposed at a third angle relative to the fifth face; and wherein the third engagement region is adapted to selectively receive the first edge of the one of the vanes of the vent diffuser in a third angled region between the fifth and sixth faces.

5. The device as defined in claim **4**, wherein the first, second and third engagement regions are disposed along an inside edge of the second end of the hook member and opposite the inner surface of the flexible member.

6. The device as defined in claim **5**, further comprising a plurality of additional engagement regions comprised of two faces disposed at an angle relative to each other and adapted to selectively receive the first edge of the one of the vanes of the vent diffuser therein; and wherein each of the additional engagement regions is disposed on the inside edge of the second end of the hook member.

7. The device as defined in claim **1**, wherein the locking mechanism further comprises a connector member disposed on the inner surface of the flexible member, and wherein the connector member is fixedly secured to the inner surface of the flexible member in a fixed orientation relative to the inner surface; and the connector member is adapted to engage a different region of the one of the vanes from that engaged by the hook member.

8. The device as defined in claim **7**, wherein the connector member comprises:

a tab fixedly secured to the inner surface of the flexible member and extending outwardly therefrom, said tab in combination with the inner surface of the flexible member being adapted to engage a second edge of the one of the vanes.

9. The device as defined in claim **8**, wherein the tab includes a first section and a second section, wherein the first section is fixedly secured to the inner surface of the flexible member, is generally planar along its length, and is disposed at an angle relative to the inner surface of the flexible member; wherein the second section extends outwardly from an end of the first section; and wherein the second section is curved along its length and arches away from the inner surface of the flexible member.

10. The device as defined in claim **1**, wherein the adjustment mechanism comprises:

a first guide and a second guide engaged with the inner surface of the flexible member, each of the first and second guides being oriented generally at right angles to the interior edge of the flexible member; wherein the channel is defined between the first and second guides; and when the first end of the hook member is in the first position the first end of the hook is closer to the interior edge of the flexible member than when the first end of the hook member is in the second position.

11. The device as defined in claim **1**, wherein the adjustment mechanism further includes:

a stop extending outwardly from the inner surface of the flexible member and into the channel, and:

a slot is defined in the first end of the hook member and is sized to receive the stop of the adjustment mechanism therein; and wherein the stop is selectively engageable in the slot in any one of a plurality of different positions.

12. The device as defined in claim **11**, wherein the stop is movable between an engaged position and a disengaged position, and when in the engaged position, the stop substantially prevents movement of the first end of the hook member along the length of the channel, and when in the disengaged position, the stop does not prevent movement of the first end of the hook member in the channel.

13. The device as defined in claim **11**, further comprising:

an aperture defined in the flexible member and extending between the inner and outer surfaces thereof; and wherein the locking mechanism further includes:

a release button engaged with the hook member and extending through the aperture, and wherein a portion of the release button extends for a distance outwardly beyond the outer surface of the flexible member; and wherein the release button is selectively movable to an engaged position, and when in the engaged position, the release button is adapted to release the hook member from engagement with a vane of a diffuser to which the hook member is attached.

14. The device as defined in claim **1**, where in the flexible member further includes an interior edge and an exterior edge opposed thereto, and side edges extending between the interior and exterior edges thereof; and wherein the device further comprises an extension member which is selectively engageable with one of the interior and exterior edges of the flexible member to increase the overall length of the flexible member and is subsequently removable therefrom to return the flexible member to its original length.

15. The device as defined in claim **14**, wherein the extension member comprises:

a planar member having an upper surface, a lower surface, a first end, a second end and side edges extending therebetween, and

a connector assembly provided adjacent one of the first and second ends for selectively engaging the planar member to one of the interior and exterior edges of the flexible member.

16. The device as defined in claim 15, wherein the one of the first and second ends which engages the one of the interior and exterior edges is of substantially the same length as the one of the interior and exterior edges and the other of the first and second ends is shorter than the one of the interior and exterior edges.

17. The device as defined in claim 15, wherein the connector assembly comprises:

a first flange extending outwardly from the outer surface of the extension member and parallel thereto, said first flange extending for a distance outwardly beyond the one of the first and second ends of the extension member;

a second flange extending outwardly from the inner surface of the extension member and parallel thereto, said second flange extending for a distance outwardly beyond the one of the first and second ends of the extension member; and

a gap defined between the first and second flanges; and wherein the one of the interior and exterior edges of the flexible member is received within the gap and is retained therein.

18. The device as defined in claim 17, wherein the one of the interior and exterior edges of the flexible member includes a lip that projects beyond one or both of the inner and outer surfaces thereof, and the upper flange of the extension member defines a shoulder positioned to interlockingly engage the lip when the flexible member and extension member are engaged with each other.

19. A device for altering the airflow pattern from a ceiling vent diffuser having an interior surface and an exterior surface and where the airflow through the diffuser is from the interior surface and toward the exterior surface thereof, said device comprising:

a flexible member having an inner surface, an outer surface, an interior edge, an exterior edge and a pair of side edges extending between the interior and exterior edges;

a locking mechanism extending from the interior surface and being adapted to detachably engage the flexible member to the vent diffuser so as to obstruct a region of openings in the diffuser and thereby substantially prevent airflow from that obstructed region; and wherein the locking mechanism comprises:

a tab fixedly secured to the inner surface of the flexible member and extending outwardly therefrom, said tab in combination with the inner surface of the flexible member being adapted to engage a second edge of the one of the vanes;

a first hook member secured to the inner surface of the flexible member and extending outwardly therefrom, said first hook member having a first end and a second end and being resiliently biased to engage a second edge of one of the vanes; and

an adjustment mechanism disposed on the inner surface of the flexible member; and wherein the first end of the first hook member is engaged with the adjustment mechanism and is movable therein between a first position and a second position; and, when the first end of the first hook member is in the first position, the second end of the first hook member is disposed in a first location set at a first distance relative to the inner surface of the flexible member; and when the first end of the first hook member is in the second position, the second end of the first hook member is disposed in a second location set at a second distance relative to the inner surface of the flexible member and wherein moving the hook member between the first and second positions results in the first end of the hook member moving along the inner surface of the flexible member.

20. The device as defined in claim 19, wherein the second end of the first hook member is curved relative to the first end thereof and in a direction extending toward the inner surface of the flexible member and wherein the first hook member is spring-biased toward the inner surface of the flexible member.

21. The device as defined in claim 20, further comprising at least one additional hook member that is selectively engageable with the adjustment mechanism when the first hook member is disengaged therefrom, and wherein the at least one additional hook member includes a second end that is differently configured to the second end of the first hook member.

* * * * *